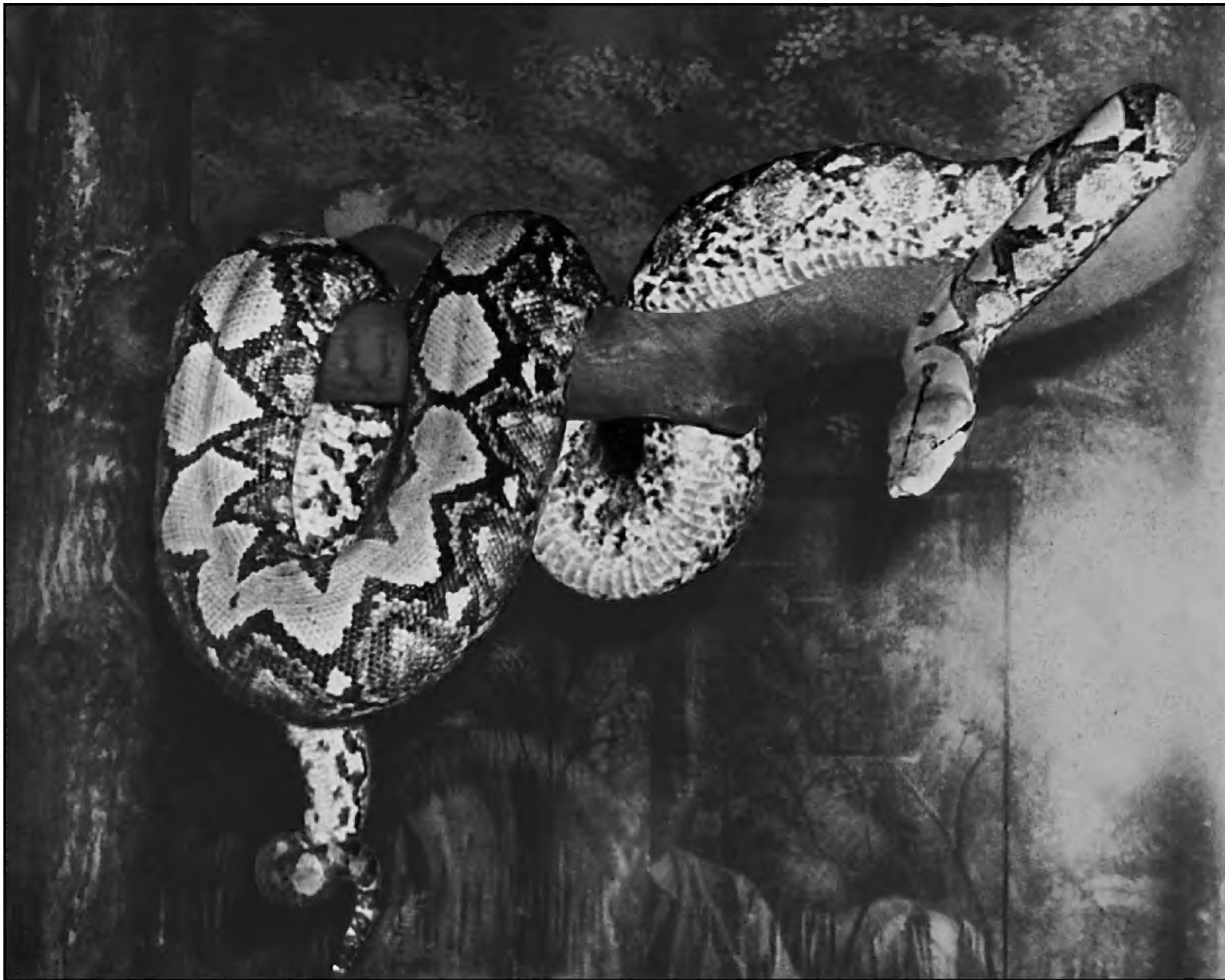

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BULLETIN OF THE CHICAGO HERPETOLOGICAL SOCIETY

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The Corrected Lengths of Two Well-known Giant Pythons and the Establishment of a New Maximum Length Record for Burmese Pythons, <i>Python bivittatus</i>	David G. Barker, Stephen L. Barten, DVM, Jonas P. Ehram and Louis Daddono	1
The Significance of an “Insignificant” Wetland in Brown County, Wisconsin	Philip A. Cochran	6
Notes on Reproduction in Atlas Day Geckos, <i>Quedenfeldtia trachyblepharus</i> (Squamata: Gekkonidae) from Morocco	Stephen R. Goldberg	7
The Tympanum: Invading to the South: Comments on Research on Salinity Tolerance of Burmese Pythons	David G. Barker and Tracy M. Barker	9
The Tympanum: A Challenge to Every Reptile Keeper	Cindy Steinle	10
Advertisements		11
Herpetology 2012		12
Unofficial Minutes of the CHS Board Meeting, December 16, 2011		15
Chicago Herpetological Society Income Statement: January 1—December 31, 2011, and Balance Sheet, December 31, 2011		16

Cover: Reticulated python, *Broghammerus reticulatus*. Photograph of “Colossus” at the Pittsburgh Zoo by Bill Allen.

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The Corrected Lengths of Two Well-known Giant Pythons and the Establishment of a New Maximum Length Record for Burmese Pythons, *Python bivittatus*

David G. Barker¹, Stephen L. Barten, DVM², Jonas P. Ehrsam³ and Louis Daddono

There is strong popular interest in the sizes of giant pythons that dates far back into history and continues to the present day. This was particularly well illustrated by the media hysteria that followed the USGS news release on 20 February 2008 that was titled “USGS Maps Show Potential Non-Native Python Habitat Along Three U.S. Coasts.” The report that followed described the Burmese python as “huge” with a maximum size of 7–8 m (23 ft–26 ft 3 in) (Rodda et al., 2008/2009; Reed and Rodda, 2009). The countless newspaper articles, news reports and documentaries that followed typically stressed the “massive” size of Burmese pythons and of pythons in general.

We have seen a lot of Burmese pythons in captivity over the past 40 years, and none approached those lengths. We believe that a realistic size limit for this species has taken on greater importance since Burmese pythons are no longer considered to be a subspecies of the Indian python, *Python molurus*, and are now recognized as a species, *Python bivittatus* (Jacobs et al., 2009; Schleip and O’Shea, 2010). Prior to this taxonomic change, many of the historical records of the largest specimens of Indian pythons and Burmese pythons have been confused.

In the course of our research, we found numerous examples of the difficulties in making correct measurements of living pythons. There are significant discrepancies that have arisen when the measurements of living pythons are later compared to the measurements of those same pythons at death. The length of a living large python, estimated or measured, is significantly greater than the measurement made at death in every case we found. Indeed, in our experiences, we all have witnessed examples of this phenomenon.

We are not aware of any mention in herpetological literature that at any point in life does the length of a snake decrease. Snakes grow relatively rapidly at a young age, and then the rates of growth slow, but at no time do they reverse. We here state that we do not believe that there is a significant difference in the live length of a snake soon before death and the length then measured after death. However, so far as we are able to learn, this has never been investigated; we acknowledge that there is some small possibility that snakes actually shrink after death, but this is not our experience or observation and we cannot offer any explanation for what that process might be.

We here publish previously unreleased data regarding the accepted record maximum size of the Burmese python, *Python bivittatus*, held by a female Burmese python known as “Baby.” This snake was on public display during the period 1994–2003 at Serpent Safari, a permanent herpetological exhibition located in Gurnee, Illinois. One of the authors [LD] was the owner of this snake and another [SLB] is the veterinarian who cared for Baby.

In the course of our investigations, we have even come to question the actual length of what is widely accepted as the largest snake ever maintained in captivity, that being “Colossus,” a reticulated python, *Broghammerus reticulatus*, that resided in the Pittsburgh Zoo from 1949 until 1963. The history of Colossus is perhaps the best example of the discrepancy between purported size and actual measured size.

Colossus

The reticulated python known as Colossus arrived at the Highland Park Zoo [now known as the Pittsburgh Zoo & PPG Aquarium] in August 1949 and remained there on exhibit until death in April 1963. By most accounts, Colossus was received from an animal dealer in Singapore, although Pope (1961) reported the origin of Colossus as “Siam” [now Thailand]. Colossus arrived at the zoo identified as a wild-caught adult female that was 6.71 m (22 feet) in length. In fact, Colossus was a male, and was several feet shy of that length.

We received this memory of Colossus from Arthur Bianculli. Bianculli was first a volunteer and then curatorial assistant at the Carnegie Museum from 1955 to 1979. He wrote, “I did see Colossus many times when he was alive. When I was a boy during the 1950s, I would walk over 4 miles to the Highland Park Zoo a few times every year. Colossus was usually lying near the front of his enclosure, often right up against the glass.”

Bianculli continued, “Colossus wasn’t obese, but he wasn’t skinny either. He was healthy looking, well-muscled, with beautiful colors, an intricate pattern, and a radiant iridescence. In another nearby enclosure there was kept an anaconda which was shorter than Colossus, but was noticeably thicker. So, I would say that Colossus was about the proper weight for a python, possibly only slightly heavier than a wild specimen. Unfortunately, I don’t know if Colossus was friendly or not because I never saw him interact with the keepers, nor did I ever see him feeding. I don’t remember ever hearing any anecdotes about his being aggressive. To be perfectly honest, I can’t remember ever seeing Colossus move. I don’t know if he was lethargic by nature, or if he was always busy digesting, but every time I saw him he stayed perfectly still. My friends and I would stop and stare at him for perhaps 15 minutes, hoping to see him move, and sometimes wondering if he was alive. I think the only movement we ever saw might have been a flick of the forked tongue. I don’t think Colossus was famous or even well-known at that time. I think that came later, thanks to the Guinness Book of Records. I mean everyone realized that he was big, but no one imagined that he might be the biggest.”

We don’t completely agree with Bianculli’s assessment of the possible obesity of Colossus. There are two pictures of

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Colossus published opposite page 45 in Pope (1961). The lower image, reprinted below, shows a large, apparently fit, reticulated python, heavy, but not ridiculously so. However, the upper image of a coiled Colossus is the picture of an immensely obese reticulated python. Not a scale touches another on the posterior body. It's highly likely that this picture shows Colossus digesting one of his many 30-pound meals of pig, but the distension of the scales on the posterior body is typical of a very fat python with a massive amount visceral fat; such distension is not seen on a more slender python regardless of a meal. According to Barton and Allen (1961), Colossus consumed 68 pigs totaling 1991 pounds of food in his first 11 years of captivity. No doubt, Colossus did grow to gigantic size on this diet.

Herb Ellerbrock is a keeper in the Reptile Department of the Pittsburgh Zoo—and a living longevity record in the Reptile Department. He began his employment there shortly after the death of Colossus and 48 years later is still there. Ellerbrock (pers. com.) also grew up in the area of the zoo, visited the Reptile House whenever possible, saw Colossus many times, and knew many of the keepers who cared for this giant snake. Ellerbrock reports to us that Colossus was not tame, not trustworthy, and was never directly handled by keepers.

In a report on the feeding and growth of captive boas and pythons, Barton and Allen (1961) identify Colossus as “the male reticulated python received at the Pittsburgh Zoo” and as “the most spectacular snake now on display in the United States.” Allen was then the supervisor in the Reptile Department of the Pittsburgh Zoo, and directly involved in the care and maintenance of Colossus. Barton and Allen (1961) state that the most accurate measurement of the weight of Colossus was made in 1954 when he was found to weigh 133.7 kg (295 pounds). The means by which this measurement was made is not described.

An account featuring Colossus and titled “The Largest Snake Ever Held in a Zoo” was published by Guinness World Records Limited (Wood, 1972). It states that on 12 June 1957 Colossus weighed 145.1 kg (320 pounds), and cites Barton and Allen (1961) as the source of this information; we note that this datum is nowhere mentioned in that account. However, Pope (1961)

also mentions that Colossus weighed 320 pounds in 1957.

In the Barton and Allen paper, Allen states that Colossus was measured at 7.1 m (23 ft 3 in) on 4 June 1951; at 8.3 m (27 ft 2 in) on 24 February 1954; and at 8.7 m (28 ft 6 in) on 15 November 1956. Allen describes the means used to obtain the measurements as holding a measuring tape over the giant snake's body through a small gap between the transfer cage and the exhibit, and measuring section by section as the snake entered its cage. Barton and Allen (1961) state “We cannot offer these length data as exact measurements, because of the way in which they had to be collected, but we are certain they are accurate to within a few inches.” The last several years of Colossus's life, there was general certainty that he was at least 30 feet in length.

Colossus died at the zoo on 14 April 1963. The next day several small Midwest newspapers each ran a similar small article, likely a press release issued from the Pittsburgh Zoo. The following article, published in the *Indiana Evening Gazette* from Indiana, Pennsylvania, is an example:

Advanced Age, Pneumonia Kill Pgh. Zoo Python

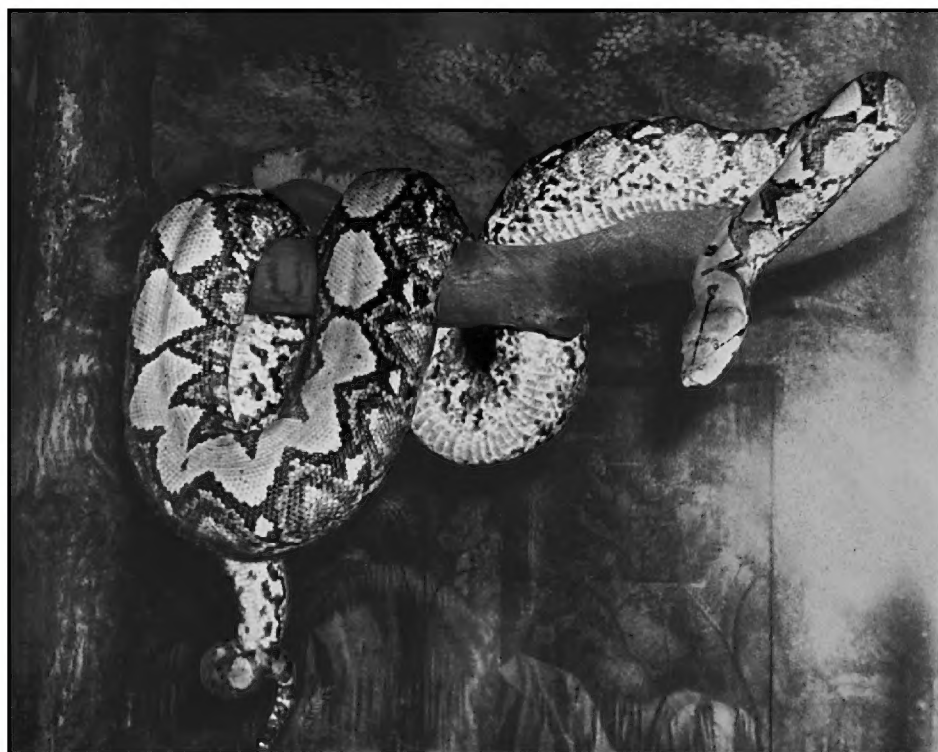
PITTSBURGH (AP)—Advanced age and pneumonia have taken the life of a snake believed to be one of the longest in captivity.

Colossus, 28½ feet long and weighing 300 pounds, died Sunday at the Highland Park Zoo. A Reticulated Python, he was thought to be about 30 years old.

Colossus was placed on display at the zoo in 1949 when he was 22 feet long. He was brought here from Malaya via Singapore.

However, the story was not correct. In the Guinness account about Colossus, Wood (1972) published several quotes from a letter he received from Bill Allen, dated 23 April 1966, regarding the death of Colossus. Allen writes that Colossus was not weighed that day but stated “[the body of Colossus] weighed over 200 pounds, as it took several men all they could do to move it, by dragging and pulling.” More significantly, Allen reported that Colossus measured 24 feet. Allen explained this rather significant decrease in length writing “[the body of Colossus] was stiffened up and vertebrae had pulled together shrinking the snake.” Wood (1972) stated that an autopsy of Colossus revealed that some vertebrae and “several rib sections” were nearly eaten through by reptilian tuberculosis.

According to Bianculli, the body of Colossus was delivered intact to the Carnegie Museum. There, on the morning of 15 April 1963, the carcass was skinned by Neil D. Richmond, then the Curator of Herpetology at the Carnegie Museum. The snake confirmed to be male and measurements were taken of the skin and the body. Today the skull and an assortment of vertebrae and ribs from Colossus are deposited in the collection of the Carnegie.



Colossus in his exhibit at the Pittsburgh Zoo. Photograph ca. 1960 by Bill Allen, Curator of Herpetology, courtesy of Herb Ellerbrock, Reptile Department, Pittsburgh Zoo and PPG Aquarium.

One of the authors [JPE] placed a request to Stephen P. Rogers, current Collections Manager of the Carnegie Museum, to receive the catalog information on Colossus held by the Museum. Rogers very graciously responded and sent this information: “We do not have the entire skeleton of Colossus, only a skull and selected vertebrae and ribs. Any disease that was present was probably not preserved in the bones saved. The data from the Catalogue is as this: CM 38716 PYTHON RETICULATUS MALAYSIA: SPECIFIC LOCALITY UNKNOWN, MALE, COLLECTOR UNKNOWN, PARTIAL SKELETON - SKULL, SOME VERTEBRAE & RIBS. “NAMED COLOSSUS. PITTSBURGH ZOO, DIED 14 APR, 1963. LOCALITY GIVEN AS MALAYA. FRESH HIDE 23' 11", SKELETON 20' 10", HEAD WIDTH 3.75", HEAD LENGTH 6.75", TAIL 27.5". SEE: BARTON, A J AND W.B. ALLEN 1961 ZOOLOGICA 46:2 P 83-87. I am not sure where the 28 feet length came from as the skeleton proper was only 20 feet 10 inches according to the original data.”

An excellent illustration of the difficulty of accurately estimating the length of a living large python comes from Merel J. Cox (1991). Cox is a herpetologist who has traveled and lived in Southeast Asia, and has seen many reticulated pythons in his life. Cox wrote in *The Snakes of Thailand and Their Husbandry* that he personally had seen a reticulated python “... at a length of a few centimeters less than ten meters.” In the preparation of *Tales of Giant Snakes* (Murphy and Henderson, 1997), author John Murphy contacted Cox, asking where he had seen this tremendous specimen. Cox answered, “... it was at the Pittsburgh Zoo, and the snake was named Colossus.”

Colossus truly was an immense, big-bodied, giant snake, but he was 6.35 m (20 ft 10 in) in total length, exceptionally long for a male python, but nowhere near as long as was generally reported. It seems likely that Colossus did visibly grow larger in front of his keepers during his 14-year span in the Pittsburgh Zoo, but he was growing heavier, not longer. Colossus was neither the longest nor the heaviest snake ever maintained in captivity.

Baby

In a recent book on Burmese pythons, Dorcas and Willson (2011) state on page 28 that the length of Burmese pythons “... may approach 25 feet (7.62 m) in extremely rare circumstances” and then on page 129 they list the record maximum size for a Burmese python as 8.23 m (27 feet). The source of these data is not cited, but it is likely *Guinness World Records*—one of the editions published from 2003 to 2006, which refer to an individual snake named Baby.

So far as we have found, most, possibly all, reports published in the past 18 years that mention Burmese pythons with lengths of 6.1 m (20 ft) or longer refer directly or indirectly to Baby. Baby was a gigantic female Burmese python owned by one of the authors [LD].

Baby died of complications from a metastatic renal tumor. She was just shy of 27 years of age. She was old for a Burmese python; the published longevity for Burmese pythons, set by a python at the San Diego Zoo, had a known age of 28 years, 3 months, 9 days (Slavens and Slavens, 2000).

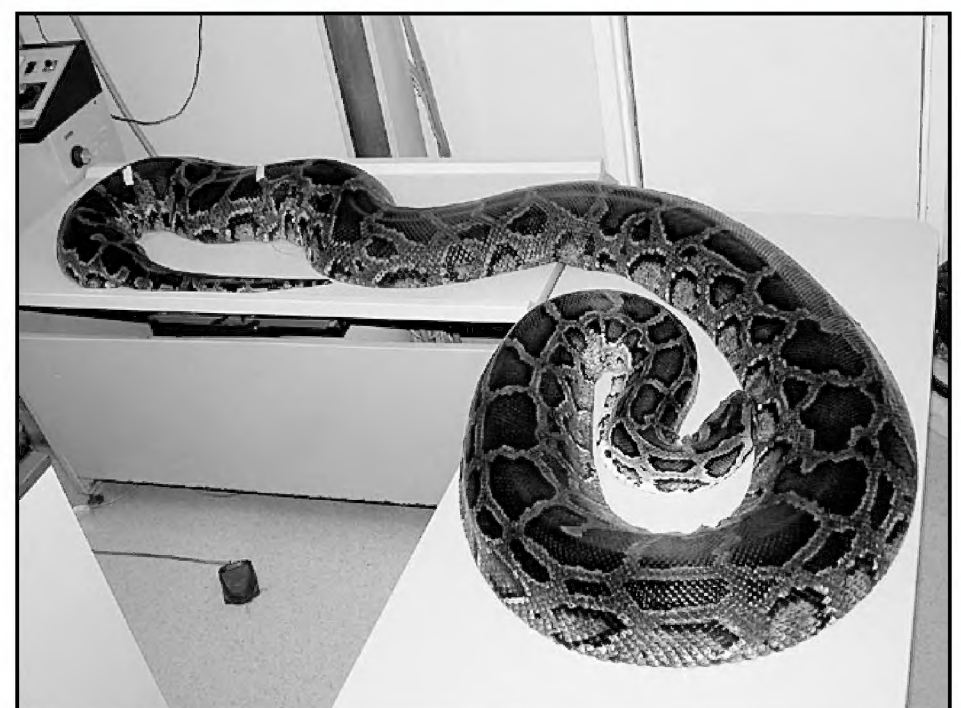
Baby first came to public attention in 1994 in an article published in the third issue of the new color, glossy herp magazine, *Reptiles* (Didier, 1994). The article featured a picture of Lou Daddono with Baby, and the snake looked to be a genuinely large specimen. In the interview, Daddono states that Baby was “approximately 20 feet long.” Baby was again featured in *Reptiles* six years later, then described as 7.62 m (25 ft) in length (Cooper, 2000).

According to information sent in 2009 to one of the authors [JPE] from Joan Singer, General Manager of Serpent Safari in Gurnee, Illinois, Baby was “certified” by the Guinness Book of World Records as the largest snake in captivity in 1998. A team from Guinness World Records Limited and Fox TV visited Serpent Safari and “officially” measured Baby. Her weight was measured to be 182.8 kg (403 pounds), the heaviest snake ever weighed at the time.

As is typical of Burmese pythons, Baby was a gentle snake that tolerated handling and she was measured while moving in her cage using a cloth measuring tape that was run down the center of her back; her length was thereby recorded to be 27 feet long. Baby was first listed in *The Guinness Book of World Records* in 1999, and continued to be listed as the heaviest snake ever reliably measured until the 2006 issue.

Due to her spreading cancer and failing health, Baby was euthanized in the veterinary office of one of the authors [SLB]. Shortly after death, she was stretched full length down a hall and measured with a steel tape. Her actual length was determined to be 5.74 m (18 ft 10 in).

Like Colossus, Baby was genuinely a gigantic snake. By all accounts, and evident in all photos, as she grew older she became obese. Those keepers who cared for her and the public who admired her all assumed that she was growing longer as she grew heavier, but that was not the case. The eye can deceive and, as we have pointed out, it is very difficult to determine the length of a living large snake. We are willing to accept that, at least on the day she was officially weighed, she tipped the scales at 403 pounds. But Baby was significantly shorter than the 27 feet with which she was credited.



Baby in the examining room of the veterinarian toward the end of her life. Her medical problems have caused her to lose more than 100 pounds of weight. Photograph by Stephen L. Barten, DVM.

Baby was unchallenged as the record longest Burmese python ever measured. With this realization of the dramatic reduction in her actual length, there comes the question of what, then, *is* the record maximum length of Burmese pythons?

First, however, we want to point out that we are not aware of any attempt by the various involved parties to purposely deceive in their overestimations of the lengths of either Colossus or Baby. Honest mistakes were made in the very difficult endeavor to measure a live giant snake. Colossus was a huge dangerous snake, very difficult to measure, while Baby was publicly measured by an objective third party. It may be that neither the Pittsburgh Zoo nor Serpent Safari corrected the overestimations when and if they became aware of them, but they can scarcely be faulted for not wanting to lessen the publicity and impact of their best known and most popular attractions.

The lesson to be learned from these two examples is that length records for large specimens of pythons, boas and anacondas must be based on measurements made of the intact body soon after death, using a steel tape and in the presence of witnesses. Alternatively, a giant snake that is heavily sedated or anesthetized enough to allow it to maintain a relaxed, straightened position also can be measured accurately. Those measurements must then be published.

The record maximum length for Burmese pythons, *P. bivittatus*

It is important to recognize a record maximum length for a species. That length is to be equal to the length of the longest known specimen that has been accurately and correctly measured. We point out that it is also important that the measurements of other large specimens be entered into the literature, so that a general picture of the maximum size of a given taxon is formed.

We stress that even in species with indeterminate growth patterns, as the growth of reptiles has been described, long life does not necessarily mean exceptionally large size. Only a very small percentage of Burmese pythons, given the necessary longevity and conditions, will achieve anywhere near the maximum record size for the species. Most large older adults will be significantly smaller than the maximum length.

The problem of a single giant individual such as Baby is that her widely accepted length was so much greater than that of any conspecific that no one bothered to record the lengths of other very large Burmese pythons. During the past 30 years, there have been more than 100,000 Burmese pythons in captivity in the United States and there have been many older large females that should have been measured and their lengths recorded, but were not because they were thought to be so much smaller than the purported length of Baby.

The story of the record maximum size of boa constrictors makes a strong parallel to this situation in Burmese pythons, and illustrates the importance of identifying other large specimens. Oliver (1958) reported that in during WWII, a crew working on malaria control in the jungle of Trinidad killed a huge boa constrictor, *Boa constrictor*; this boa was reported to be 18 feet 6 inches in length. This snake was so much larger than any other boa constrictor that the measurements of only very few other large specimens have since been entered into the literature. This

Trinidad record was accepted and published in many other manuscripts, including the widely read books of Pope (1961), Minton and Minton (1973), and Mehrtens (1987). However, Boos (1992) decided to investigate the record; he was able to locate and contact two members of the crew some 50 years after their work in Trinidad, and learned that this giant snake was actually an anaconda, *Eunectes murinus*, and not a boa constrictor. Because of this mistaken identity, today there still is no well accepted record maximum length for boa constrictors even though boas are common in many areas of their natural distribution and they are one of the most common snakes in captivity.

Designating a record maximum length for Burmese pythons takes on additional importance for two reasons. One is that this taxon is recently reclassified as a species and morphological data specific to Burmese pythons is important. A second is that exaggerated claims of the potential giant size of Burmese pythons are being made by the invasive python camp in south Florida, feeding incorrect information to the media.

We looked through historical accounts and entries for Burmese pythons for published records of the largest specimens. While nearly every account lists a maximum size for the species, most are anecdotal, stating lengths that are not actually based on specimens. For example, Deuve (1970) states that the maximum size of Burmese pythons is 7.62 m (25 ft) but does not explain on what this length is based or from where it came. He then states that the largest specimen known from Laos measured 4.50 m (14 ft 8 in) and was captured in 1957 in the town of Savannakhet—this is the kind of record that we looked for. Schleich and Kästle (2002) state that the maximum length is 7.62 m specimen based on a specimen from Laos and cite Deuve (1970) as the source, but that is not what Deuve stated. Both Whitaker and Captain (2004) and Saint Girons (1972) list 6.0 m as the maximum size without any explanation. Shah and Tiwari (2004) list the maximum size as 6.5 m (21 ft 4 in) without identifying any source for this measure; they do state that a 6.25 m shed skin was found in Royal Bardiya Park, but shed skins stretch significantly and in our opinion, the shed skin could have come from a python only 4 m in length. Boulenger (1912) states “Grows to 30 feet” without explaining on what this is based and apparently ignorant of the fact that neither Indian pythons nor Burmese pythons are found on the Malayan Peninsula. Rooij (1917) goes a degree higher and states that the species “reaches 10 meters,” but likewise, she does not refer to any specific specimen and apparently is only repeating hearsay.

Wall (1921) lists measurements of several large pythons. Wall did not recognize Burmese pythons as a valid taxon, so data from Indian pythons and Burmese pythons are confused. He lists a specimen mentioned in a periodical, *Land and Water*, (August 10, 1866 or 1867) with a length of 18 ft 9 inches from Musoorie in Uttarakhand Province, India. That would be west of the western end of Nepal, and a python from that locality would probably be identified today as a *Python bivittatus*; however, if found a short distance south of Musoorie, there would be a strong chance that this would be a *Python molurus*.

The largest Burmese python record we can find is a snake that was shot by the Maharajah of Cooch Behar, taken in the district of Cooch Behar in Assam in the late 19th century, cited

by Anonymous (1901), Wall (1921), Daniels (1983), and Murphy and Henderson (1997). This snake was taken as a trophy and is purported to have measured 5.84 m (19 ft 2 in). As reported by Anonymous (1901), this snake was originally identified as a reticulated python; it was killed, skinned, the skin sent to a London taxidermist, mounted as a full mount, and then returned to India where the Maharajah donated the mount to the Bombay Museum. Later, according to Wall (1921) the specimen was identified as *Python molurus (sensu lato)*. Unfortunately, it is not clear if the reported length is based on the freshly killed snake, the skinned hide or the length of the mounted specimen. The specimen was taken more than 110 years ago and it is unlikely that the uncertainty about its measure can be resolved.

Thus, it is our opinion that the record maximum length for Burmese pythons, *Python bivittatus*, is 5.74 m (18 ft 10 in) and that record is based on the specimen identified as Baby. Even though she lost 29% of her purported 27 feet length, so far as we are able to find, she remains the longest Burmese python.

As we mentioned earlier, we suspect that many possible record-length snakes may not have been reported over the past 18 years because of the published exaggerated size of Baby. We expect that this new record maximum length may well be exceeded in the future. However, the candidate for the record will have to be correctly and accurately measured and the measurement published before it can be accepted as a record.

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The Significance of an “Insignificant” Wetland in Brown County, Wisconsin

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Efforts to weaken wetlands protection in the state of Wisconsin have placed a spotlight on a small patch of land near Lambeau Field, home of the Green Bay Packers. It is located at the crossing of U.S. Highway 41 and Lombardi Avenue in Ashwaubenon, an “island” surrounded by commercial and residential development. A bill passed by the state Senate and Assembly early in 2011, and backed by Governor Scott Walker, has exempted this wetland from the normal permit process that would be required for the wetland to be filled (Jones, 2011). It was part of a plan by a car dealer from Neenah, acting on behalf of the Green Bay Packers, to develop the site. It was originally hoped that a Bass Pro Shop would be built there, but that company declared that it would not build on a wetland and separated itself from the project (Johnson, 2011; Jones, 2011). More recent information can be found in Lueders (2011) and at the website of the Wisconsin Wetlands Association.

I knew the wetland in question and the adjacent patch of forest when I lived and taught in the Green Bay area from 1984 to 2001. At first I lived a few blocks away and would bring my kids there to walk in the woods. Later I brought my college students. I could show them trilliums and wild ginger and lilies-of-the-valley blooming in the spring and witch hazels in the fall. There were native trees like beech and blue beech and butternut (a species of special concern in Wisconsin), and one day I noticed at least six species of ferns. I used the area to show my students how to locate calling frogs by triangulating on them with flashlights.

The wetland and forest provided habitat for a surprising number of amphibian species. Indeed, during visits to this site, my students and I were able to document for the first time in Brown County the occurrence of blue-spotted salamanders (*Ambystoma laterale*), spring peepers (*Pseudacris crucifer*), wood frogs (*Lithobates sylvaticus*) and American toads (*Anaxyrus americanus*) (Cochran et al., 1987; Cochran and Knutsen, 1987). Gray treefrogs (*Hyla versicolor*), chorus frogs (*P. triseriata*), and leopard frogs (*L. pipiens*) were also present. The only reptile I observed at this location was a snapping turtle (*Chelydra serpentina*) killed by a car on the adjacent road, although I found a garter snake (*Thamnophis sirtalis*) on the western side of U.S. Highway 41 before that area was developed for housing.

The diversity of amphibians present at this wetland reflected the close proximity of a mature forest. Even though the area as a whole was surrounded by roads, it was possible for the woodland species (e.g., blue-spotted salamanders, wood frogs, and spring peepers) to move directly between forest and breeding wetland without crossing pavement. Creation of artificial wetlands may be touted as a way to mitigate loss of natural wetlands through development, but how many artificial wetlands are created with an adjacent forest?

It is not the purpose of this report to evaluate the ecological significance of this wetland, although I do not believe that its role as habitat for a diversity of amphibians has been discussed previously. I would like to suggest, however, that the area had recreational significance, at least to the children of the neighborhood who were obviously using it in the 1980s and 1990s, and it certainly was of significance as an educational resource.

I haven't been back to this spot since I moved away from the Green Bay area in 2001. I understand that it has been degraded to some extent by being partially filled, perhaps illegally (Lueders, 2011). Even in 1990, “For Sale” signs indicated that its future was uncertain. And that, in microcosm, was one reason I left a good job in the Green Bay area. It was just getting too difficult to do that job the way I think it should be done. It was getting too difficult to take students to decent natural or even semi-natural habitats within the time available during a laboratory period. I sometimes use population data for Brown County as the basis for a classroom exercise in use of population models. Using data for the period 1960–1990, when the population increased by 56% (Brown County Planning Commission, 1994), and for the period 1990–1998, when the population increased from 194,594 to 218,149 (Hildebrand, 1998), and assuming a simple exponential model, results in similar estimates of the population doubling time (47 and 49 years, respectively). That these are somewhat lower than an estimate of the U.S. population doubling time (51 years) that included a healthy estimate of the contribution of illegal immigration (Brewer and McCann, 1982) reflects not the contribution of illegal immigration to Brown County population growth, but rather the substantial effect of legal immigration (i.e., the result of development). How much is enough of a good thing?

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Notes on Reproduction in Atlas Day Geckos, *Quedenfeldtia trachyblepharus* (Squamata: Gekkonidae) from Morocco

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Abstract

A histological examination was performed on gonadal material from a sample of 69 *Quedenfeldtia trachyblepharus* from Morocco. I recorded a mean clutch size of 1.13 eggs $\pm$ 0.34 SD, range = 1–2. Two is a new maximum clutch size for *Q. trachyblepharus*. Histological evidence in the form of oviductal eggs and concurrent early yolk deposition for a subsequent clutch, in the same female indicates multiple clutches are produced. The smallest mature females were 31 mm SVL; smallest mature males were 34 mm SVL.

Quedenfeldtia is a genus of diurnal geckos endemic to Morocco (Sindaco and Jeremčenko, 2008) and consisting of two species, *Q. moerens* and *Q. trachyblepharus* (Arnold, 1990). *Quedenfeldtia trachyblepharus* is known from the Atlas Mountains of Morocco where it inhabits rock faces and boulders from sea level to 4000 m (Schleich et al., 1996). Information on its reproduction is in Schleich et al. (1996) including mixed type of spermatogenesis, clutches of one egg deposited March–June in the Anti-Atlas range and 2–3 clutches deposited April–July in the Haut Atlas range and utilization of communal egg-laying sites. Loveridge (1947) reported one female from May contained one large ovum. The purpose of this note is to add information on the reproductive biology of *Q. trachyblepharus* based on histological analysis of gonadal material from museum specimens.

Methods

Sixty-nine *Q. trachyblepharus* (33 males, mean snout–vent length [SVL] = 40.1 mm $\pm$ 3.0 SD, range 34–46 mm) and (36 females, mean SVL = 37.3 mm $\pm$ 3.4 SD, range 31–43 mm) collected 24 May 1974 at Igrherm [alternate spellings: Igherm or Irherm], Taroudant Province, in the Souss-Massa-Drâa region of Morocco (30.06250°N, 8.40833°W, datum WGS 84, elev. 1600–1700 m) and deposited in the herpetology collection of

the Field Museum of Natural History (FMNH), Chicago, Illinois, USA, were examined. The left testis was removed from males and the left ovary was removed from females for histological examination (Presnell and Schreiber, 1997).

Enlarged ovarian follicles (> 4 mm) and/or oviductal eggs were counted. Tissues were embedded in paraffin, sectioned at 5 μ m and stained with hematoxylin followed by eosin counterstain (Presnell and Schreiber, 1997). Histology slides were deposited in the FMNH herpetology collection. Ovary slides were examined for yolk deposition or corpora lutea. Testis slides were examined to ascertain the stage of the testicular cycle. Mean SVL of male and female *Q. trachyblepharus* were compared using an unpaired t-test (Instat vers. 3.0b, Graphpad Software, San Diego, CA).

Results

The mean SVL of males was significantly larger than that of females ($t = 3.5$, $df = 67$, $P = 0.001$). The only stage observed in the testicular cycle was spermiogenesis (sperm formation) in which the lumina of the seminiferous tubules are lined by clusters of sperm or metamorphosing spermatids. The smallest reproductively active male (FMNH 197773) measured 34 mm

Table 1. Stages in the ovarian cycle of *Q. trachyblepharus* from May 1974..

Month	n	Quiescent	Early yolk deposition*	Enlarged follicles > 5 mm	Oviductal eggs**
May	36	7	6	2	21

* No oviductal eggs.

** Six of 21 females with oviductal eggs were undergoing concurrent yolk deposition for a subsequent clutch.

SVL. Since no males < 34 mm SVL were examined, this SVL should be considered an approximation of the minimum size for maturity in males.

Four stages were noted in the ovarian cycle (Table 1); (1) quiescence, no yolk deposition; (2) early yolk deposition (basophilic vitellogenic granules in the ooplasm); (3) enlarged ovarian follicles > 3 mm; (4) oviductal eggs. Mean clutch size for 23 females was 1.13 ± 0.34 SD, range = 1–2. The smallest reproductively active female (FMNH 197774) measured 31 mm SVL and was undergoing early yolk deposition. Six of 21 females from May with oviductal eggs (29%) were undergoing concurrent yolk deposition for a subsequent clutch. Since no females < 31 mm SVL were examined, this SVL should be considered an approximation of the minimum size for maturity in females.

Discussion

According to Schleich et al. (1995), *Q. trachyblepharus* males have a mixed type of spermatogenesis. Saint Girons

(1982) categorizes this form of spermatogenesis as sperm production (spermiogenesis) from March to May. Although the full testis cycle has not been ascertained, *Q. trachyblepharus* appears to exhibit a mixed type of spermatogenesis as all males from May were producing sperm.

My finding of clutches of two eggs is a new maximum clutch value for *Q. trachyblepharus*, although a clutch of one egg appears more common for this species. One egg is typical for geckos of the family Sphaerodactylidae (Fitch, 1970) in which *Quedenfeldtia* is classified. My data support *Q. trachyblepharus* producing at least two clutches in the same reproductive season although the claim of Schleich et al. (1995) that three clutches may be produced will require further investigation.

In conclusion, my data have provided the following new information on the *Q. trachyblepharus* reproductive cycle: (1) females may produce clutches of two eggs; (2) histological verification is presented that multiple clutches are produced as evidenced by concurrent yolk deposition in females with oviductal eggs ; (3) females of 31 mm SVL and males of 34 mm SVL are mature. Additional monthly samples warrant examination before the timing of events in the *Q. trachyblepharus* reproductive cycle can be ascertained.

Acknowledgment

I thank Alan Resetar (FMNH) for permission to examine *Q. trachyblepharus* and for facilitating the loan.

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Appendix

Quedenfeldtia trachyblepharus from Morroco examined from the herpetology collection of the Field Museum of Natural History (FMNH), Chicago, Illinois: FMNH 197641, 197642, 197644, 197647, 197649-197654, 197656, 197658, 197659, 197661, 197665, 197666, 197668, 197678, 197679, 197683, 197684, 197687, 197689, 197693, 197694, 197697, 197698, 197701, 197702, 197704, 197707, 197710-197713, 197716-197718, 197722, 197724, 197726, 197729, 197735-197737, 197742, 199743, 197745, 197749, 197750, 197753, 197755, 197758, 197759, 197762, 197764, 1997767, 197768, 197770, 197771, 197773-197775, 197777, 197779, 197780, 197782, 197783, 199932.

The Tympanum

Invading to the South: Comments on Research on Salinity Tolerance of Burmese Pythons

Apparently researchers in the Giant Constrictor Risk Assessment Partnership [GCRAP] in South Florida are coming to the realization that their hypothetical thesis that Burmese pythons would and could invade north into the continental United States is now in a shambles, shredded largely by the past two cold winters. The experiment of Dorcas and Willson (2010), leaving 10 pythons outside in Aiken, South Carolina, to freeze to death in snow and ice in a huge enclosure full of a variety of types of shelters certainly didn't help matters. So what do they do now?

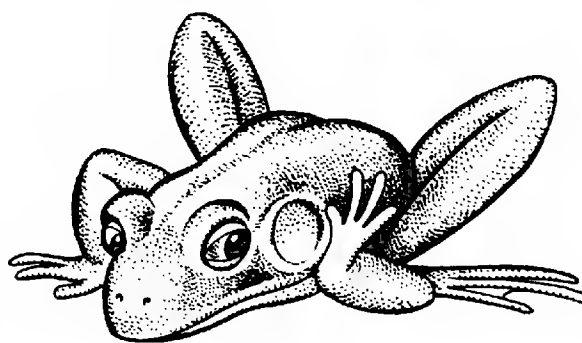
They start research projects to determine when and how those pesky pythons will invade to the south. That's right! Now they have set about determining just how the Florida Keys and the entire Caribbean beyond could be in dire danger of a flotilla of salt-tolerant pythons migrating southward, bringing with them all the scenarios of ecological collapse and eating poor pets and livestock that has never seemed to actually happen there in the Everglades. Well, there was one publicized goose incident. . . .

The brilliance of this idea is not lost upon us. We are certain that there were lots of high-fives and backslapping when someone had this brilliant idea. Really, would they rather be sitting in snowstorm in a swamp in northern Georgia setting up those ridiculously ineffective traps, preparing for the unlikely arrival of those giant slithering aliens, or sitting in Key West or Barbados, sipping piña coladas and waiting for the fleet to come in?

Of course it would be critical for them to get down there in advance and study the weaknesses of those insular ecosystems. GCRAP loves islands full of snakes—they've been monitoring brown tree snakes in Guam for 30 years now with funds well exceeding 100 million dollars of taxpayer money. Heck, they have never advertised the funding of that project and they have made it very difficult to discover—it might be 300 or 400 million dollars, courtesy of Congress, the military and the American taxpayer. Guam is where invasive snake biology was born.

So to start the ball rolling south, three researchers have published this very preliminary report titled: "Experimentally Derived Salinity Tolerance of Hatchling Burmese Pythons (*Python molurus bivittatus*) from the Everglades, Florida (USA)." The report is written by Kristen M. Hart, Pamela J. Schofield, and Denise R. Gregoire, all USGS employees, and published in the *Journal of Experimental Marine Biology and Ecology*. This is a report on a very simple experiment.

They took three groups of eight young Burmese pythons, shut them in cages, one to a box. They then gave one group only sea water to drink (salinity of 35), another group got brackish water (salinity of 10), and the third group, the lucky control group, got fresh water (salinity of .2). They then ran the experiment for 200 days. The snakes were checked five days a week, as invasive python biologists apparently don't work weekends.



Fourteen of the 16 babies in the two experimental groups died before the end of the experiment. We quote from the report: "Salinity strongly impacted survival of the hatchlings in the laboratory." They go on to state "[the result of . . .] each treatment was statistically different from the others." What that means is that the group receiving saltwa-

ter all died in 17 to 50 days (avg = 32 days). Six of the eight in the brackish-water group died (the first in 33 days, and the sixth in 197) and two in that group survived the experiment, bloated and not looking good. None of the control group died.

This is what is called a terminal experiment. Hart is a sea turtle researcher, or she was before she joined GCRAP—she knows all about salt glands and sodium balance in the blood. Schofield and Gregoire both have done very similar experiments to see how long freshwater tilapia will live in sea water and brackish water. They experimented on the animals until the animals died. The researchers knew that drinking sea water would kill the baby pythons—very few terrestrial vertebrates can survive drinking only sea water—the object was to see just how long baby pythons could live drinking only sea water and brackish water.

We suggest that this experimental design has a serious flaw. There should have been a fourth group of baby Burmese pythons that were given no access at all to water. Perhaps this was deemed too cruel, but this seems to us to be relatively important to the conclusions of this study. We don't know if anyone has tested this, but a baby Burmese python will live 20 or 30 days without drinking in normal captive conditions; in certain environmental conditions of high humidity and cool temperatures, baby pythons deprived of water probably can survive considerably longer than that. It appears to us that it is possible that this experiment shows how long a baby python can go without drinking before it is forced by thirst to drink sea water that then quickly kills it. It does not show any "experimentally derived tolerance" of baby pythons to poisonous levels of salt.

We note that in the manuscript the authors write that: ". . . individuals in the experimental treatment survived for about a month **in** full-strength sea-water (salinity of 35), and about five months **in** brackish-water (salinity of 10)." They go on to state that "Survival **in** salt water conditions during the first year of life for this species was unknown before now, and current global warming scenarios that incorporate sea-level rise are predicted to significantly reduce the area of suitable habitat for Burmese pythons, . . ." They then speculate that ". . . hatchling Burmese pythons could survive on average 32 days **under full salt-water conditions**..." [bold italics ours].

These statements take considerable liberty with the actual experiment. The baby pythons were never **in** salt-water and the researchers have no idea if baby pythons can live immersed and/or swimming **in** salt-water.

Taking every advantage of the media, the USGS is quick to advertise research that might increase their funding. Director

Marcia McNutt stated in a press release that came out the day of the publication “This study demonstrates the distinct possibility that pythons could spread to new suitable habitats one estuary at a time.” Apparently when Director McNutt read that the baby pythons were *in* salt-water conditions, she thought the snakes were actually in salt-water conditions, swimming their little hearts out for 32 days, not sickly, severely dehydrated, weak and bloated, dying of thirst.

The press release also credits Hart as saying “This recent study, based on lab experiments conducted by researchers from the U.S. Geological Survey, provides initial evidence that pythons may be able to survive in marine and estuarine environments such as bays, inlets and open seas.”

Our own conclusion on the results of this little study is that it clearly shows that drinking salt-water kills pythons. A lot of salt kills them fast and less salt kills them slower. It can kill them in as little as 17 days, about as fast as some of the poisons that have been tried on pythons in the USGS and USDA studies to “manage” the python problem.

Our second suggestion to the researchers for further experiments to investigate the resilience of pythons to swimming in salt water is this: Since there apparently are no objections to terminal experiments with baby pythons, it’s now time to actually investigate the swimming ability and endurance of pythons in fresh and salt-water conditions. We recommend that Hart and her colleagues buy 24 300-gallon Nalgene containers with smooth sides—round tubs 7 ft in diameter and 3 ft deep (expensive, but the government is paying). Then divide them into the three experimental groups and fill eight with salt-water, eight with brackish-water, and eight with fresh-water. Drop a baby python into each one and see how long they last until they drown. That seems to be the real way to determine the actual probability that baby pythons might swim over to the Keys and on out into the Caribbean.

USGS ought to be willing to maintain a live video feed on the USGS website showing those little pythons trying to keep their noses out of the water. It would probably have a huge audience and it would show us all the lengths that GCRAP researchers are willing to go to save the Everglades. **David G. Barker and Tracy M. Barker, vpi@beecreek.net**

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A Challenge to Every Reptile Keeper

Recently a Fox News poll about keeping exotic pets began circulating around Facebook.

“Stop the animal rights extremists, and vote!” was the cry from the reptile community.

While organized opposition from animal rights extremists to the keeping of reptiles as pets is a definite political problem, the most powerful way we can fight back is on a very personal level.

Unless the average person knows someone who keeps reptiles, they have no understanding of why we keep these animals. They don’t understand the joy we get out of our pets, and the happiness that having these animals gives to us.

And because they have no understanding of why we keep these animals, they are fertile ground for negative messages about reptile keeping.

If we want to protect our right to share our lives with these amazing animals, we have to take that advantage away from our enemies. We need to reach out to the people who don’t understand us and our pets. We need to share our love of our animals in ways they’ll understand and relate to.

For me, I enjoy keeping pretty things, like my carpet pythons with their vibrant colors. I enjoy watching the animals blossom and grow under my care. I enjoy the daily interactions I have with my iguana Osama Binguana, who is notorious for seeking out my attention. I enjoy working on target training with my iguanas as well. I can’t train them to sit and roll over, but I can train them to go where I want with food rewards.

All these things are concepts every pet owner can relate to, even if they have no interest in pets who aren’t furry and cute. That’s why I spend at least 30 hours a month doing outreach.

I am at schools and libraries, pet stores and Scout meetings, as well as at general pet events. You know, the kind where dog and cat people go? So do I. And I explain what goes into caring for the ball python. Why certain animals do not make great pets, and what it takes to keep them if you are interested.

I explain the legalities of keeping reptiles, and what people need to do to be responsible keepers. I am not above correcting bad knowledge, and challenging existing keepers to improve their habits, or telling them what they need to know to be a better keeper and a better representative of the reptile community. One bad apple can ruin a bunch—and change public perception in a heartbeat. I’m there to try to keep that from happening.

For those who know me or have met me, I am a brash, tattooed metalhead. None of that is present in my public persona representing the community. My tattoos are covered, my make-up is demure, and my language is family-friendly. My clothes are neat and pressed, and I have a spare shirt or two packed for changes in case I get pooped on. My animals are freshly washed the morning of the event, and only my most trustworthy are displayed.

When dealing with the “I saw on Animal Planet . . .” tales, I say, “There are always some people who are into things for the wrong reasons. People do bad things in every walk of life, and it

is no different in the pet community. Look at Michael Vick.” That’s something dog and cat owners understand.

It’s great but not enough to work paid jobs at zoos, or doing paid educational events with your animals at birthday parties. It isn’t enough to present at a herp society or reptile group, or to get together at your local show and talk about reptiles.

We need to reach a broader audience. We need to reach the people who will look at your snake and crinkle their faces with an “euwww” response, and get past that to the common ground we share. We also need to help them see how responsibly keeping these animals benefits and protects wild populations.

This is why I challenge every single keeper to donate at least four hours of free reptile education to the general public in 2012.

- Contact your local library and ask if you can come in on a Saturday with a presentation.
- Contact your local pet shop and ask if you can set up a reptile display.
- Reach out to local Scout groups.

Don’t just huddle with people who share your views at reptile shows; try to make a positive change on the perception of our beloved pets with people who don’t share them yet.

I personally average 30 hours a month, doing free education in environments where people may not really expect to see reptiles. I challenge you to only four hours in a whole year.

This will not make the animal rights extremists back off, but it will make their audience more informed and less receptive to their distortions. Rather than falling on the ears of people who have no experience with a reptile keeper, it will fall on those of someone who has heard from us, who has seen the love and care we have for our animals, who may not want to keep reptiles themselves, but at least gets that we’re not criminals and freaks, but pet lovers like them.

Will you rise to the challenge, or will you let the enemies of us and of our animals have the first, last, and only word? **Cindy Steinle** [This opinion piece first appeared in Cindy’s blog for December 27, 2011, on Kingsnake.com. For more of Cindy’s blogs see <http://www.kingsnake.com/blog/authors/7-Cindy-Steinle>]

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For sale: herp publications: *Harry Frauca’s Book of Reptiles* by Harry Frauca, 1966, 100 pp., 100 b&w and 12 color photos, contains some experiences collecting Australian reptiles including carpet python and lace monitor, DJ with three tears, otherwise excellent condition, hardbound, \$35; *A Contribution to the Herpetology of West Pakistan* by Sherman A. Minton, Jr., 1966, 158 pp., 28 plates (2–3 b&w photos per plate), 12 figs., 7 tables—this is an imperfect copy of this scarce title, the last 30 pages (pp. 155–184) are missing and have been replaced with a repeat of pp. 59–90—author’s name and book title hand-lettered in ink on spine, softbound, \$75; *New Zealand Amphibians & Reptiles* by Joan Robb, 1980, 128 pp., 32 color plates with 2–5 photos each, native and introduced amphibians, geckos, skinks, range maps, ecology, DJ, hardbound, \$85; *Australian Snakes, Crocodiles, Tortoises, Turtles, and Lizards* by Eric Worrell, 1967, 64 pp., many color and b&w photos, hardbound, \$20. All publications in excellent condition unless otherwise indicated. \$3 postage and handling for orders under \$25, free for over \$25. William R. Turner, 7395 S. Downing Circle West, Centennial CO 80122; (303) 795-5128; e-mail: toursbyturner@aol.com

Free herp-related music scores: *The Serpentes Preludes* (in two parts) and other herp-related music scores by Brian S. Gray are available as PDFs at: www.free-scores.com. Search for Gray, Brian at the site.

Herp Researcher/Educator Volunteers: **Research 4 Reptiles, LLC.** is seeking volunteers, ages 18 and older, to assist with outdoor herpetological programs for teenagers during the Summer 2012 season. Our mission is to provide challenging, hands-on, field-based programs for participants ages 12 to 18 years old to inspire enthusiasm for and understanding of native Illinois reptile and amphibian species. All educational programs are taught entirely outdoors at Midewin National Tallgrass Prairie in Wilmington, Illinois, and are limited to 8 participants. Details about programs and volunteer opportunities can be found on our website at: <http://www.research4reptiles.biz>. Email Holly Zak at research4reptiles@comcast.net or call 630-337-0757.

Herp tours: **Costa Rica herping adventures**. Join a small group of fellow herpers for 7 herp-filled days. We find all types of herps, mammals, birds, and insects, but our target is snakes. We average 52 per trip, and this is our 10th year doing it. If you would like to enjoy finding herps in the wild and sleep in a bed at night with air-conditioning, hot water and only unpack your suitcase once, instead of daily, then this is the place to do it. Go to our web-site <http://hiss-n-things.com> and read the highlights of our trips. Read the statistics of each trip and visit the link showing photos of the 40 different species we have found along the way. E-mail at jim.kavney@gmail.com or call Jim Kavney, 305-664-2881.

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Herpetology 2012

In this column the editorial staff presents short abstracts of herpetological articles we have found of interest. This is not an attempt to summarize all of the research papers being published; it is an attempt to increase the reader's awareness of what herpetologists have been doing and publishing. The editor assumes full responsibility for any errors or misleading statements.

BROWNSNAKE MICROHABITAT SELECTION

S. J. Hecnar and D. R. Hecnar [2011, J. Herpetology 45(4): 478-483] note that understanding habitat selection is a fundamental goal of ecology and is vitally important for effective species conservation. Dekay's brownsnake (*Storeria dekayi*; hereafter "Brownsnake") is one of the most widespread snake species in eastern North America, and its association with cover objects is generally well known, but details regarding choice of refuges are largely unknown. The authors investigated Dekay's brownsnake microhabitat use during annual surveys at Point Pelee National Park, Ontario, Canada, from 1990 to 2010. They systematically checked all woody debris in stabilized dune habitat for snakes and noted the size and state of decay of woody debris that was used. Nearly all observations were of gravid females under woody debris. Greater use of large, moderately decayed woody debris relative to the range of available debris provided strong evidence of selection. Although most snakes observed were solitary, a significant number of aggregations were found. Female brownsnakes appear to migrate to stabilized dune from other habitats in the park to select suitable woody debris for gestation and parturition. Although these refuge sites would reduce predation risk, they also provide a moister and cooler microclimate than ambient conditions. Numerous observations of shed skins also suggested that this woody debris provides important microhabitat for ecdysis. Analysis of relative abundance over time showed considerable variation in numbers (1–31/yr) and an increasing trend. These results provide strong evidence of microhabitat selection by this species and highlight the importance of not making generalizations about microhabitat requirements, even for common snake species.

INDIGO SNAKE HOME RANGES

D. R. Breining et al. [2011, J. Herpetology 45(4):484-490] note that wide-ranging snake species are particularly sensitive to landscape fragmentation, and understanding area requirements is important for their conservation. They used radiotelemetry to quantify how eastern indigo snake (*Drymarchon couperi*) home-range sizes were influenced by sex, land cover, and the length of time (weeks) individuals were radio tracked. Eastern indigos were found to have the largest home ranges among the snake species studied. Female home ranges averaged 44 and 76 ha, respectively, for kernel and minimum convex polygon estimators. Male home ranges averaged 156 and 202 ha, respectively, for kernel and minimum convex polygon estimators. Many animal species respond to habitat fragmentation by using larger areas than in unfragmented landscapes, but this study found that indigo snakes in fragmented landscapes used much smaller areas. The length of time that snakes were tracked had almost no influence on home-range size compared to sex and land cover type. Results suggest that maintaining populations of this large wide-ranging predator will require large conservation areas with minimum fragmentation.

TESTING SPECIES DISTRIBUTION MODELS

D. R. Trumbo et al. [2011, Canadian Journal of Zoology, 89(11):1074-1083] report that species distribution models (SDMs) have become an important tool for ecologists by providing the ability to predict the distributions of organisms based on species niche parameters and available habitat across broad geographic areas. However, investigation of the appropriate extent of environmental data needed to make accurate predictions has received limited attention. The authors investigated whether SDMs developed with regional climate and species locality data (i.e., within Missouri, USA) produce more accurate predictions of species occurrences than models developed with data from across an entire species range. To test the accuracy of the model predictions, field surveys were performed in 2007 and 2008 at 103 study ponds for eight amphibian study species. Models developed using data from across the entire species range did not accurately predict the occurrences of any study species. However, models developed using data only from Missouri produced accurate predictions for four study species, all of which are near the edge of their geographic ranges within the study area. These results suggest that species distribution modeling with regionally focused data may be preferable for local ecological and conservation purposes, and that climate factors may be more important for determining species distributions at the edge of their geographic ranges.

NORTHERN PACIFIC RATTLESNAKE HIBERNACULA

C. M. Gienger and D. D. Beck [2011, Canadian Journal of Zoology 89(11):1084-1090] note that hibernacula play an important role in the ecology of high-latitude snakes, and communally denning species may occupy their hibernacula for half the year or more. Because of the long duration spent at hibernacula, such sites can provide multiple benefits to snakes including shelter from lethal overwinter conditions, social opportunities, and basking sites important in thermoregulation. Adequate hibernacula seem to be limited on the landscape and individuals travel several kilometers to use and reuse specific sites. The authors investigated orientation, physical structure, and thermal properties of sites used as hibernacula by northern Pacific rattlesnakes (*Crotalus oreganus*), and compared them with random sites that appeared similar but were not used for hibernation. Hibernacula occurred primarily on south-facing talus slopes, were oriented on less-steep slopes, and were composed of rocks that were intermediate in size to randomly occurring sites. Results suggest that the orientation and physical composition of hibernacula allow them to be stable over time, allowing snakes to repeatedly locate the sites, as well as providing predictable overwinter refuge. Hibernacula were also warmer on the surface than north-facing random sites and provided increased basking opportunities for snakes thermoregulating in early spring after emergence from hibernation.

KEELED BOX TURTLES ON HAINAN ISLAND, CHINA

Wang J.-C. et al. [2011, Chelonian Conservation and Biology 10(2):159-164] studied reproduction and nesting of the keeled box turtle (*Cuora mouhotii*) during 2003 and 2009 on Hainan Island, China. The first gravid turtle was found on 28 April and nesting was from May until July, with a peak in mid-June. The first fresh nest was observed on 1 June and last fresh nest on 27 July. Some females laid eggs from 1 clutch in 2 batches. Clutch size ranged from 1 to 5. Mean egg measurements were as follows: length, 4.5 cm; width, 2.7 cm; and mass, 19.8 g. There was no significant relationship between turtle body size (mass, length, height and width) and clutch size or egg size (mass, length and width). Clutch size was significantly correlated with the egg mass and egg width. Possible low fertility, low hatching rate, and the long period to reach maturity imply that *Cuora mouhotii* has a low intrinsic rate of population increase. This, combined with overcollecting and habitat destruction, requires development of more effective conservation strategies for this endangered species.

BIGGER NOT ALWAYS BETTER

M. C. Jones et al. [2011, J. Herpetology 45(4):455-456] note that sexually dimorphic traits are used for mate selection either by female choice (intersexual selection) or male–male competition (intrasexual selection). In anurans, both types of selection mechanisms, especially intersexual selection, generally will favor large males. In bufonids, however, male size does not seem to be a factor in mate selection. Very little is known about the mating preferences of the endangered Houston toad (*Bufo houstonensis*). Studies examining the breeding dynamics of *B. houstonensis* were conducted during the early 1980s, with conflicting results. To further examine mate selection, 329 Houston toads were collected from Bastrop State Park, Texas, and the snout–urostyle length (SUL) was measured. There was no significant difference in size for males found in amplexus, suggesting females may not select larger males.

COMPETITION FOR BREEDING POOLS

M. J. Ryan and D. S. Barry [2011, J. Herpetology 45(4):438-443] note that competition and predation are two of the most important factors structuring communities, and these interactions may be exaggerated when two closely related species share similar resource requirements. They studied size-based habitat selection of artificial phytotelmata for deposition of tadpoles in two species of poison-dart frogs, *Dendrobates auratus* and *Oophaga granulifera*, in Costa Rica. *Dendrobates auratus* exhibits male parental care, and its tadpoles are predaceous, whereas *O. granulifera* exhibits biparental care, and its tadpoles are obligatory trophic egg eaters. These behavioral traits are integral factors in habitat selection for these two species. The authors found that the predaceous *D. auratus* selected large- and medium-sized pools, whereas *O. granulifera* selected all pool sizes but had a preference for small pools. *Oophaga granulifera* paid a high cost for exploiting large pools, experiencing 100% mortality when sharing a pool with *D. auratus*. The use of small versus large pools in these species is rooted in each species' divergent parental care strategies and tadpole feeding behaviors.

OVERWINTERING BY BABY EASTERN BOX TURTLES

R. L. Burke and W. Capitano [2011, Chelonian Conservation and Biology 10(2):256-259] studied 11 nests, and the resulting neonates of eastern box turtles (*Terrapene carolina*) in New York in 2001 and 2002, and documented neonate emergence and movements. None overwintered in the nest; instead, they emerged in the fall and overwintered buried shallowly close to the nest, where they were exposed to temperatures as low as -7°C. Further research is needed regarding neonate *T. carolina* behavior and the relative advantages of overwintering in the nest and overwintering terrestrially outside the nest.

TADPOLES AND REED CANARY GRASS

T. A. G. Rittenhouse [2011, J. Herpetology 45(4):491-496] notes that ephemeral, fishless wetlands with open canopies are known to be quality breeding habitats for pond-breeding amphibians. Yet many wetlands including these are commonly invaded by exotic plants, resulting in vegetation shifts from diverse native vegetation to monotypic stands of novel material. This study tested the hypothesis that an invasive grass, reed canary grass (*Phalaris arundinacea*), would reduce survival, growth, and development rates of four tadpole species relative to a mixture of native grasses. Grass type and amount were manipulated in fully replicated mesocosm experiments that contained American toads (*Anaxyrus americanus*), Cope's gray treefrogs (*Hyla chrysoscelis*), pickerel frogs (*Lithobates palustris*), or wood frogs (*Lithobates sylvaticus*). Counter to expectations, there was little evidence that diverse vegetation enhanced wetland quality for amphibians, because the quantity of decomposing plant matter influenced tadpole performance more than type of plant matter. Growth and development of tadpoles was generally not affected, indicating that this invasive grass produced minimal direct (e.g., toxic alkaloids) or indirect (i.e., through the food web) effects on tadpoles. However, differences in survival were found. It is possible that large amounts of grass supplied excess organic matter that decomposed rapidly underwater, causing a pulse of nutrients early in the larval period and anoxia. Wetlands invaded by reed canary grass may successfully produce metamorphs given that hydroperiods are adequate and eutrophic conditions do not occur in the wetland.

GEOFFROY'S TOAD-HEADED TURTLES IN BRAZIL

L. Schneider et al. [2011, Chelonian Conservation and Biology 10(2):206-212] studied reproduction and noted predation of *Phrynops geoffroanus* nests along the Guaporé River of the Brazilian and Bolivian Amazon during the beginning of the falling water level season in July 1989 and 2008. They searched for nests on the banks of the Guaporé River every morning along the Guaporé River between Divisa sector, state of Rondônia in Brazil and Versailles village, Department El Beni, in Bolivia. Ten nests were found in 1989 and 46 nests in 2008. Clutch size ranged from 7 to 16 eggs and was larger in 2008. There was no relationship between egg size and nest size or the size of eggs between year 1989 and year 2008. The predation rate in 2008 was 89.1%, all depredated by the lizard *Tupinambis teguxin*. Habitat loss for the lizard may be creating habitat utilization shifting and increased turtle nest depredation rates.

REEVES' POND TURTLES IN JAPAN

D. Suzuki et al. [2011, *Chelonian Conservation and Biology* 10(2):237-249] note that Reeves' pond turtle, *Mauremys reevesii*, is an aquatic geoemydid species that is broadly distributed in East Asia. Like many other Asian turtles, this species is facing an extinction crisis in most countries where it occurs. In Japan, however, this turtle commonly occurs in various freshwater habitats. Although the Japanese populations have generally been considered to be native, a few recent studies have yielded circumstantial evidence that suggested that they had originated from relatively recent artificial introductions from abroad. To evaluate the validity of such a view, the authors analyzed sequence variations of the mitochondrial cytochrome b gene and the control region in *M. reevesii* samples from various localities in Japan and adjacent countries. The results revealed the presence of 3 distinct genetic groups (groups A, B, and C) in the Japanese samples, of which groups A and B included haplotypes that were almost identical with some haplotypes from the Korean sample and the Chinese and Taiwanese samples, respectively. Sequences from *M. reevesii* shell products commercially traded in Taiwan included one that was almost identical to the group C sequence. The current Japanese populations of *M. reevesii* seem to have been derived from multiple artificial introductions from adjacent countries. This finding implies a need to be concerned about the effect of *M. reevesii* on the Japanese native wildlife, particularly on the Japanese endemic pond turtle, *Mauremys japonica*, with which *M. reevesii* is phylogenetically closely related and reportedly frequently hybridizes in the wild. However, the Japanese population may be useful as a genetically variable stock for conservation of this species, which is highly endangered in most of its range outside Japan.

EFFECTS OF LOW-ENERGY DIETS

S. Reguera et al. [2011, *Canadian Journal of Zoology* 89(12): 1178-1187] note that optimal diet theory predicts that predators optimize energy intake by balancing costs and benefits of foraging. One extreme strategy of snake foraging ecology is shown by specialist species that forage on low-energy prey, such as the mesa central blotched gartersnake, *Thamnophis scaliger*, which feeds almost exclusively on earthworms. Compared with other prey types such as small mammals, lizards, or arthropods, earthworms are low-energy prey because of their small size and high water content. Given the importance of energy acquisition for fueling snake reproduction, it is to be expected that a low-energy dietary specialist such as *T. scaliger* needs to forage frequently to store enough fat to reproduce. The high frequency of snakes containing prey, the presence of multiple earthworms in snakes, and the fact that females continue to feed when gravid suggest that *T. scaliger* is a voracious consumer of earthworms. Despite these foraging behaviors, females did not reproduce in sequential years, suggesting constraints in energy input to reproduce more frequently. A meta-analysis of the diet, body size, and reproductive frequency of some species of the genus *Thamnophis* confirms that consumption of invertebrate prey is associated with small snake size, but not with biennial reproductive frequency within the genus.

NESTING OF GREEN TURTLES AT ALDABRA

J. A. Mortimer et al. [2011, *Chelonian Conservation and Biology* 10(2):165-176] report that when Aldabra Atoll became a nature reserve in 1968, its endangered nesting green turtle (*Chelonia mydas*) population was the first to be protected in the Indian Ocean. In 1983, Aldabra became a UNESCO World Heritage Site managed by the Seychelles Islands Foundation. But prior to 1968, its green turtles suffered intense exploitation documented by trade statistics, historical literature, and a scientific study in 1927. Three population surveys conducted just before, during, and shortly after 1968 provide baseline data by which to assess the long-term population recovery monitored since 1980 using a standardized track count protocol. The 52 nesting beaches distributed along the 83-km outer rim of Aldabra were classified into 6 beach groups (WGT, SETT, DDM, DJL, CC, and North), with total beach length of 5.2 km. During Phase 1 (1980–1994) of the study, 17 index beaches (WGT #1–17) were monitored 4 times per month and other beaches opportunistically. During Phase 2 (1994–2008), index beaches (WGT #1–22 and SETT) were monitored at least 4 times per month and remote beaches monthly. Track counts were converted to estimated egg clutch production using nesting success data. Reproductive output for the atoll rose from a mean annual estimated 2000–3000 clutches in the late 1960s to 15,669 (SD = 2776) during 2004–2008, equivalent to a mean estimated 3100–5225 females nesting annually (assuming an average of 3–5 egg clutches per female). This represents a 500%–800% increase during 40 years of complete protection. During Phase 2, the rate of increase was highest at the Settlement Beach (SETT), which had historically suffered the most intense exploitation.

WOOD FROG TADPOLES IN NORTHERN PRAIRIES

D. B. Donald et al. [2011, *Canadian Journal of Zoology* 89(11):1063-1073] note that in the northern plains of North America, the wetland breeding habitat of amphibians and their populations could be reduced by a change in climate that included decreased precipitation. To test this hypothesis, relative abundance of late-stage tadpoles of the wood frog (*Lithobates sylvaticus*) was monitored from 1997 to 2010 during a wet–dry–wet cycle in 29 wetlands distributed throughout central Saskatchewan, Canada. The wetlands were dry for up to 7 consecutive years, and for a mean of 3.8 consecutive years. Consequently, tadpole occupancy of the wetlands was reduced to less than 40% for 5 consecutive years and none of the wetlands had tadpoles during the severe drought of 2001 and 2002. However, the drought had no observable long-term effect on either tadpole occupancy of wetlands or tadpole abundance. In 2007, 93% of the wetlands supported tadpoles, and in 2008 the highest mean relative abundance of tadpoles was recorded. Tadpole occupancy of wetlands was related to winter and spring precipitation ($R^2 = 0.84$) with 67% of long-term variation in occupancy related to snowfall from November to February and 17% related to rainfall from March to June. Less than 45 mm of winter precipitation for 6 consecutive years would probably cause regional extinction of populations of the wood frog.

Unofficial Minutes of the CHS Board Meeting, December 16, 2011

The meeting was called to order at 8:06 P.M. at the home of Deb Krohn. Board members John Archer and Greg Brim were absent.

Officers' Reports

Recording Secretary: Cindy Rampacek read the minutes of the November 18 board meeting, which were accepted as read.

Treasurer: Andy Malawy went over the financial report from November, and it was accepted.

Membership Secretary: Mike Dloogatch read a list of memberships expiring this month.

Sergeant-at-arms: Greg Brim counted 56 people at the November meeting.

Committee Reports

Shows:

- Notebaert, first full weekend of each month
- Great Lakes Pet Expo, February 4, 2012
- Reptile Rampage, Lake Forest, March 11
- Family Pet Expo, Arlington Racetrack, March 16–18
- NARBC Tinley Park, March 17 & 18

New Business

Jason Hood asked the new board to encourage members to submit articles to the *Bulletin*.

When Cindy spoke recently for the Minnesota Herp. Society, she got a mug. She thought this was a good idea, and suggested

we give speakers CHS shirts or other items. The board agreed that this would be a good idea.

Mike Dloogatch mentioned that the Grants Committee will meet prior to January 29 because two of its members will be unavailable the following two weeks.

Round Table

Cindy shared the importance of carbon monoxide monitors.

Mike mentioned we got a few more packages from Marcia Rybak. A ton of beanie babies and a lot of other stuff.

Deb said she was glad we all came to her house.

Lawrence has two clutches of gecko eggs.

The meeting was adjourned at 9:02 P.M.

Respectfully submitted by recording secretary Cindy Rampacek



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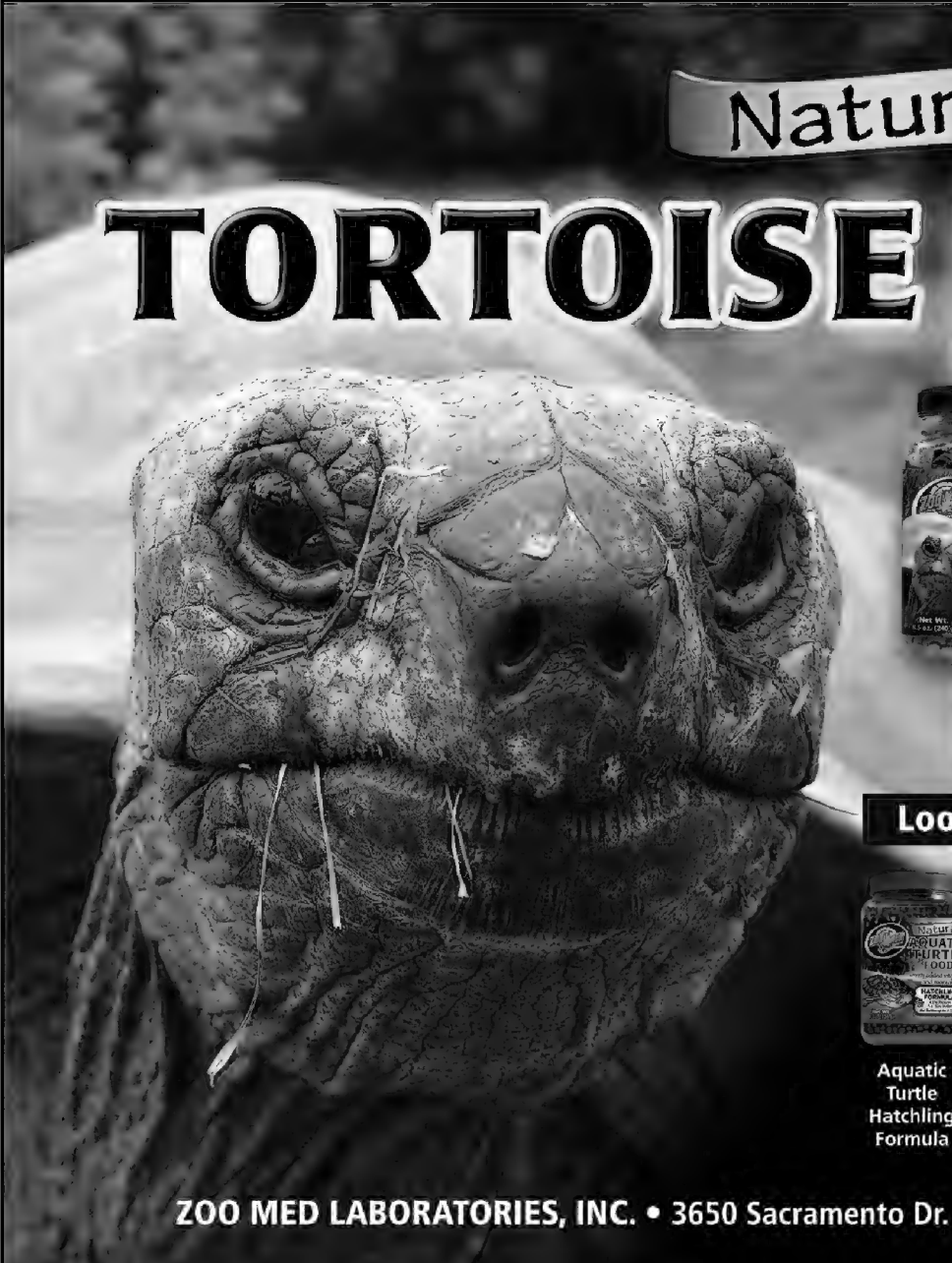


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Chicago Herpetological Society
Income Statement: January 1 – December 31, 2011

Income		Expense	
Adoptions	\$ 746.25	Adoptions	\$ 2,383.89
Grants	197.00	Grants	5,000.00
Membership dues	12,627.20	Bulletin printing / mailing	17,241.38
ReptileFest	50,523.00	ReptileFest	27,446.96
Merchandise sales	435.00	Cost of merchandise	859.34
Amazon.com	106.64	Bank / PayPal fees	86.31
Interest	28.09	Other CHS shows	45.00
Donations (unrestricted)	14,972.00	Awards	219.86
Donations (conservation)	20.00	Liability Insurance	5,404.00
Raffle	737.00	Library	51.33
Miscellaneous	956.31	Licenses and Permits	131.00
		Postage	2,168.14
		Rent (storage)	480.00
		Speaker Reimbursement	3,908.07
		Telephone	421.43
		Miscellaneous	1197.00
Total Income	\$81,348.49	Total Expense	\$67,043.71

Net Income \$14,304.78

Chicago Herpetological Society
Balance Sheet: December 31, 2011

Assets	
Checking	\$ 3,983.45
Money market	44,453.55
PayPal	882.59
Postage on deposit	379.94
Total Assets	<u>\$49,699.53</u>
Equity	
Restricted – Adoptions	\$ 4,818.85
Restricted – Grants	197.00
Retained Earnings	30,378.90
Net Income	14,304.78
Total Equity	<u>\$49,699.53</u>

UPCOMING MEETINGS

The next meeting of the Chicago Herpetological Society will be held at 7:30 P.M., Wednesday, January 25, at the Peggy Notebaert Nature Museum, Cannon Drive and Fullerton Parkway, in Chicago. The speaker will be **Ari Flagle**, a keeper in the Department of Ectotherms at the Fort Worth Zoo. Ari's topic will be "Unlocking the Secrets to Breeding Boelen's Pythons."

Speaking at the February 29 meeting will be **Mike Pingleton** of Champaign, Illinois. Mike, a field herper extraordinaire, will speak on "Herping in Mexico."

The regular monthly meetings of the Chicago Herpetological Society take place at Chicago's newest museum—the **Peggy Notebaert Nature Museum**. This beautiful building is at Fullerton Parkway and Cannon Drive, directly across Fullerton from the Lincoln Park Zoo. Meetings are held the last Wednesday of each month, from 7:30 P.M. through 9:30 P.M. Parking is free on Cannon Drive. A plethora of CTA buses stop nearby.

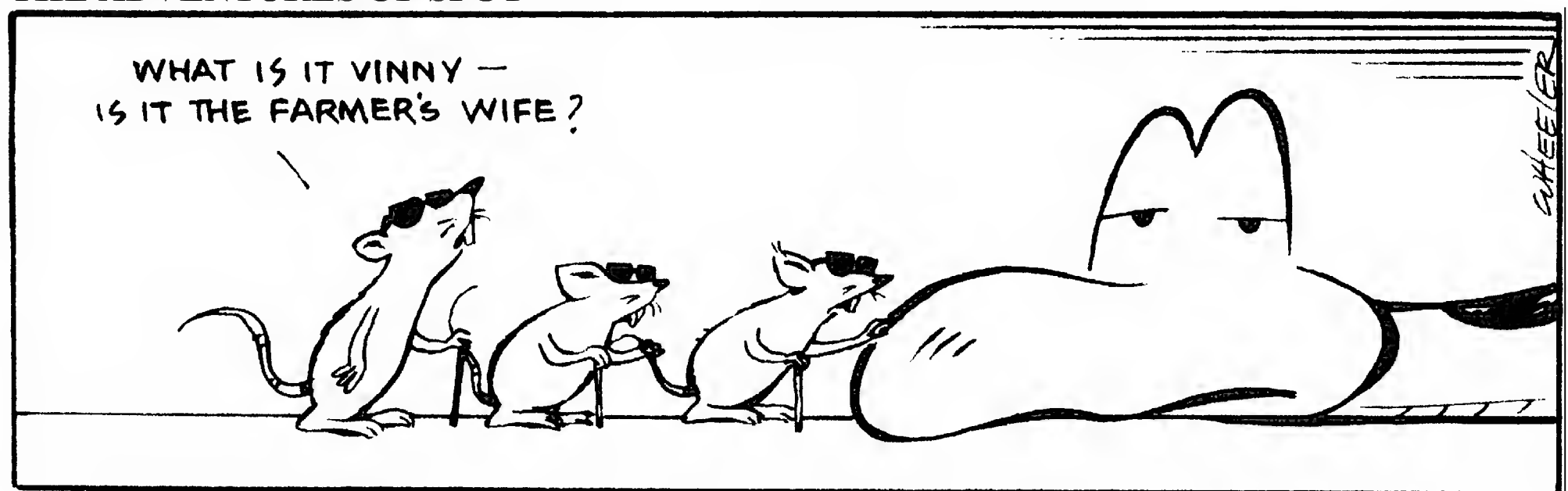
Board of Directors Meeting

Are you interested in how the decisions are made that determine how the Chicago Herpetological Society runs? And would you like to have input into those decisions? If so, mark your calendar for the next board meeting, to be held at 7:30 P.M., February 17, in the adult meeting room on the second floor of the Schaumburg Township District Library, 130 S. Roselle Road, Schaumburg..

The Chicago Turtle Club

The monthly meetings of the Chicago Turtle Club are informal; questions, children and animals are welcome. Meetings normally take place at the North Park Village Nature Center, 5801 N. Pulaski, in Chicago. Parking is free. For more info visit the group's Facebook page.

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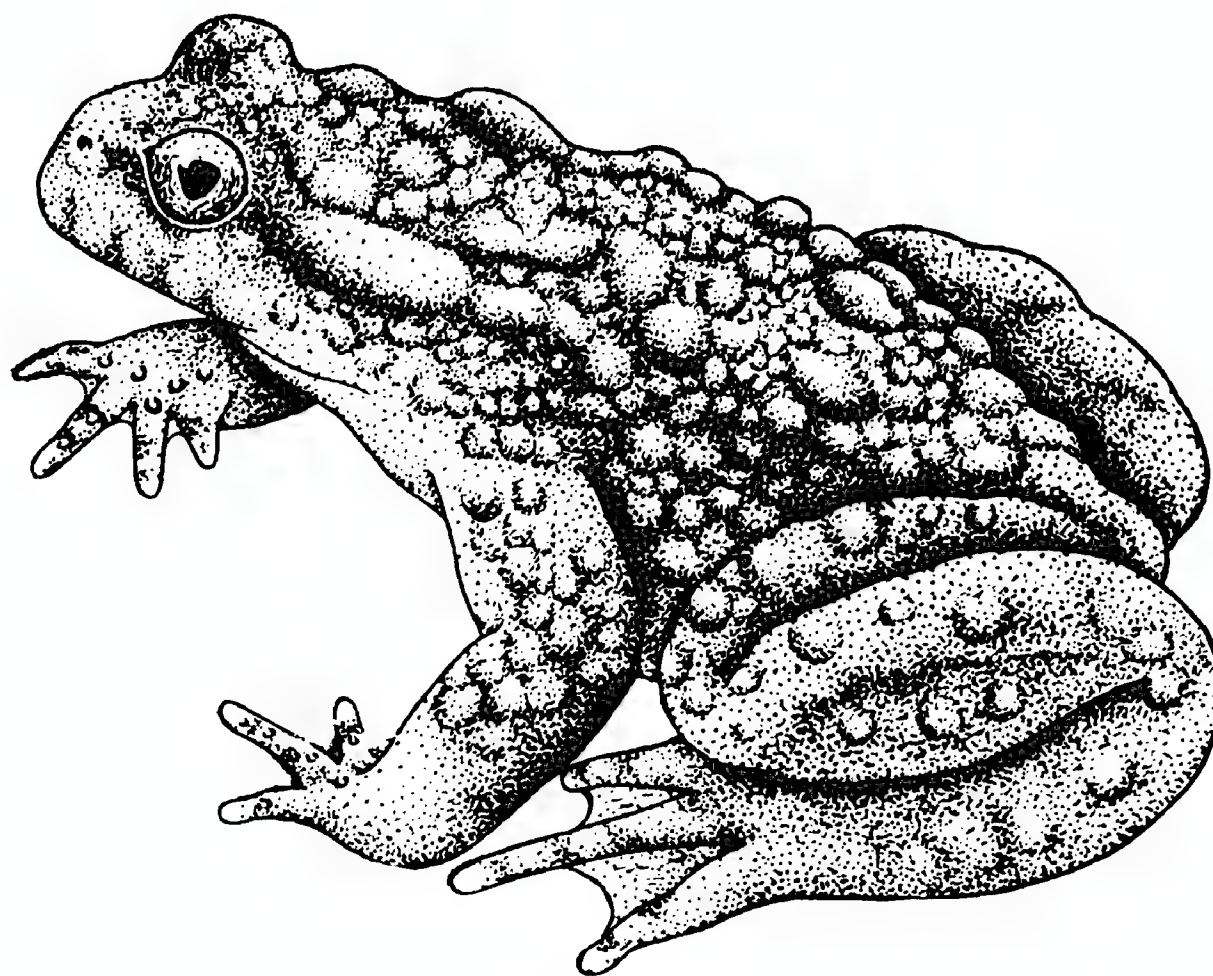
BULLETIN

of the

Chicago Herpetological Society



Volume 47, Number 2
February 2012



BULLETIN OF THE CHICAGO HERPETOLOGICAL SOCIETY

Volume 47, Number 2

February 2012

On the Cobra Cults of Myanmar (Burma)	Steven G. Platt, Win Ko Ko and Thomas R. Rainwater	17
Notes on the Herpetofauna of Western Mexico 6: Amphibians and Reptiles of Hostotipaquillo, Jalisco, Mexico	Edgar Flores-Cobarrubias, Daniel Cruz-Sáenz and David Lazcano	21
A Brief Note on Reproduction in Morelet's Leaf Frog, <i>Agalychnis moreletii</i> (Duméril)	R. Michael Burger	26
Herpetology 2012		27
The Tympanum: When People Ask Why You Keep Reptiles, Tell Them	Cindy Steinle	29
Unofficial Minutes of the CHS Board Meeting, January 13, 2012		30
Advertisements		31
News and Announcements: 2012 CHS Grant Recipients		32

Cover: Male Yunnan firebelly toad, *Bombina maxima*. Drawing from *Amphibians of Western China* by Ch'eng-chao Liu, Fieldiana: Zoology Memoirs Volume 2, 1950.

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The Chicago Herpetological Society is a nonprofit organization incorporated under the laws of the state of Illinois. Its purposes are education, conservation and the advancement of herpetology. Meetings are announced in this publication, and are normally held at 7:30 P.M., the last Wednesday of each month.

Membership in the CHS includes a subscription to the monthly *Bulletin*. Annual dues are: Individual Membership, \$25.00; Family Membership, \$28.00; Sustaining Membership, \$50.00; Contributing Membership, \$100.00; Institutional Membership, \$38.00. Remittance must be made in U.S. funds. Subscribers outside the U.S. must add \$12.00 for postage. Send membership dues or address changes to: Chicago Herpetological Society, Membership Secretary, 2430 N. Cannon Drive, Chicago, IL 60614.

Manuscripts published in the *Bulletin of the Chicago Herpetological Society* are not peer reviewed. Manuscripts should be submitted, if possible, on IBM PC-compatible or Macintosh format diskettes. Alternatively, manuscripts may be submitted in duplicate, typewritten and double spaced. Manuscripts and letters concerning editorial business should be sent to: Chicago Herpetological Society, Publications Secretary, 2430 N. Cannon Drive, Chicago, IL 60614. **Back issues** are limited but are available from the Publications Secretary for \$2.50 per issue postpaid.

Visit the CHS home page at <<http://www.Chicagoherp.org>>.

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On the Cobra Cults of Myanmar (Burma)

Steven G. Platt¹, Win Ko Ko¹ and Thomas R. Rainwater^{2,3}

Snakes are venerated in traditional societies throughout the world for a variety of reasons (Klauber, 1956; Blassingame, 1972; Morris and Morris, 1965; Minton and Minton, 1980; Seal, 2000), and cobras (*Ophiophagus hannah* and *Naja* spp.) figure prominently in the mythology and folk traditions of India, Pakistan, and parts of Southeast Asia (Minton and Minton, 1980; Seal, 2000). In Hindu mythology cobras are revered as direct descendants of the Nagas, ancient serpent gods endowed with the power to cause environmental mayhem, and bring suffering or instant death to people. Earthquakes, tidal waves, volcanic eruptions, droughts, and other natural disasters are attributed to the displeasure of the Nagas, which villagers often seek to appease during times of famine or plague. Altars to Shiva are guarded by stone Nagas and living cobras are encouraged to dwell in Hindu temples. Families often set aside patches of unkempt vegetation in household gardens where it is hoped cobras will take up residence, and small “poison shrines” are maintained for cobra worship (Minton and Minton, 1980; Figure 1). According to Buddhist teachings, cobras played an important role in the life of Gautama Siddhartha, the Indian prince who

later became the Buddha; Nagas assisted in his birth, and formed a bridge with their outspread hoods that allowed him to safely cross the Ganges River. The Buddha also sheltered beneath the hood of a giant cobra while meditating in the desert (Minton and Minton, 1980). Together these Hindu and Buddhist beliefs formed the basis of cobra cults that were once widespread in India and Southeast Asia. Cobra cults have for the most part disappeared, although snake worshiping clans are said to persist in tribal regions of Pakistan and parts of India (Minton and Minton, 1980).

Based on several accounts of travel prior to World War II, similar cobra cults — although observed by few westerners — also existed in Myanmar (at the time known as Burma). Outram (1946) described a ceremony involving hamadryads (i.e., king cobras, *Ophiophagus hannah*) near Mount Popa (20°55'N; 95°15'E; Figure 2), an extinct volcano in central Myanmar (Chhibber, 1934). Because it is thought to be the dwelling place of several important supernatural beings known as Nats (= Earth Spirits), Mount Popa is considered one of the most sacred sites in Burmese Buddhism (Tin Naing Toe, 2004). Originally part of a pre-Buddhist belief system, Nats were later incorporated into Burmese Buddhism and form the basis of elaborate local cults throughout Myanmar (Spiro, 1967). Nats are believed to dwell in forests, hills, fields, water bodies, and even large trees, and are perceived as jealous overlords of their domain, harming those who fail to recognize their suzerainty, while at the same time protecting and rewarding those who acknowledge their dominance by proper propitiation (Spiro, 1967). According to Outram (1946), Nats inhabiting Mount Popa were believed to have charged hamadryads with guarding their shrines on the mountain.

Outram (1946) accompanied residents of Chaingwa (a small



Figure 1. A cobra (Naga) shrine near the village of Agumbe in the Western Ghats of southwestern India, 2009 (Photographs by Thomas Rainwater).



Figure 2. Mount Popa, an extinct volcano in central Myanmar where a snake worshiping cult reputedly existed in the years before World War II (Photograph by Win Ko Ko).

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hamlet reportedly 6.5 km from Popa Village) as they collected hamadryads, which were said to “infest” the lowland forests surrounding the volcano. Villagers captured hamadryads by hand or with nooses suspended from long bamboo poles. After capturing a hamadryad, the handlers assured the Nats that no harm would come to the snake and promised to return it to the forest on a given day. Captured hamadryads were held for 10 days before being used in what Outram (1946) described as a “snake charming ceremony” conducted by a village “priestess.” The priestess applied a white, powdery make-up to her face and donned special loose-fitting traditional garments before interacting with the snakes. The ceremony began when the hamadryad was released; the snake immediately assumed an aggressive stance, spread its hood, and attempted to strike the priestess, who deftly avoided each downward lunge of the snake’s head. The ceremony reached a climax as the hamadryad tired, and culminated when the priestess leaned over and kissed the snake atop the head. The hamadryad was used for several performances, and then returned to the mountain and released. Because hamadryads were considered sacred animals, failure to release the snakes as earlier promised would mean certain death to the handler. Outram (1946) provided scant information on how this ceremony related to local religious beliefs or the practice of Nat worship other than stating hamadryads acted as guardians of Nat shrines on the mountain.

Another account of snake handling at Mount Popa is provided by Gillespie (1938) based on correspondence from Captain C. R. Douglas Gray, who photographed what are said to be “snake-charmers” engaged in a performance similar to that described by Outram (1946). According to Gray, hamadryads used in the performance had not been defanged and remained capable of delivering a potentially fatal bite. The snake handlers reportedly never kept “a king cobra for more than a year” and “in return for this consideration [the snakes] never bite them.” How the hamadryads were able to discern the future intentions of the snake handlers is left unstated. Gillespie (1938) suggested it was probably necessary to release the hamadryads after the snakes became accustomed to humans and no longer reacted aggressively during performances. Interestingly, Gray makes no mention of a connection between the performance and Nat worship, and the accompanying photographs show a large crowd gathered in what appears to be an entertainment venue, rather than a ceremonial or ritualistic milieu.

During a recent conservation assessment of Mount Popa National Park (Platt and Win Ko Ko, 2010), we queried a number of life-long residents in an effort to determine if a cobra cult still existed in the area. According to our informants, villagers worship *Anauk Medaw*, a female Nat believed to control the actions of venomous animals such as snakes, scorpions, and centipedes; proper propitiation of this Nat is thought to protect a person from envenomation. Additionally, a shrine to *Karli Medaw*, a many-handed Nat sheltered by two cobras, is found on Tuang Klat, an isolated pinnacle at the base of Mount Popa. However, we found no evidence for the continued persistence of rituals similar to those described by Outram (1946), and moreover, none of our informants were aware of the past existence of such a cobra cult in the area. Furthermore, in light of the brief account in Gillespie (1938), we cannot rule out the possibility

that Outram (1946) misinterpreted a form of public entertainment as a religious ritual. “Snake charming” has long been practiced in rural Burma and to a limited extent, continues today, often in association with pagoda festivals. Snake charmers are usually itinerant medicine sellers who handle venomous snakes to attract and entertain potential customers; upon completion of the performance, various medicines are proffered to the assembled crowd (Win Ko Ko, pers. obs.).

Another ritual involving hamadryads was described by Davis (1940) and Denis (1963). They witnessed it during a joint expedition to northern Myanmar and southern China immediately prior to World War II (Abbott, 1997). Neither author provided specific information on where the ritual was observed; reportedly a 19th century missionary named Hurston mentioned a “sacred hill of the snake,” describing it as a “bare black mountain” near the village of “Kensi” (Davis, 1940), and Armand Denis sponsored an expedition to locate the mountain and produce a cinematic travelogue (Abbott, 1997). After an arduous journey by vehicle and elephant, the expedition eventually located Kensi Village and succeeded in filming the ritual (Davis, 1940). The ritual was performed at a nearby cave inhabited by large hamadryads. Once every year hamadryads were captured elsewhere, transported to the cave, and released by a priestess who promised to return them to the forest 12 months later. The snakes were reportedly content to remain in the cave, and were provided with a regular supply of frogs to eat by the priestess (Davis, 1940). As described by Davis (1940), the ceremony began when the priestess entered the cave and then backed out slowly, laying bamboo mats before her, all the while uttering muffled incantations. Shortly a hamadryad estimated to be “14 feet long” (4.2 m) emerged from the cave, crawling along the trail of bamboo mats. Once in the open, the hamadryad struck repeatedly at the priestess who pinned and released it several times. The hamadryad pursued the priestess, at one point lunging forward and biting the folds of her skirt (Figure 3a). Eventually the hamadryad tired, and the priestess, praying in a subdued and soothing tone, leaned forward and kissed its mouth (Figure 3b), whereupon the snake slowly crawled back into the cave.

Although Davis (1940) provided photo-documentation of the snake ritual, its religious and cultural significance remain unclear. Indeed, several elements of the account seem fanciful and difficult to accept. For instance, Davis (1940) stated the large snakes were released into the cave and content to remain there while being fed a steady diet of frogs. First, we consider it unlikely that adult hamadryads would remain in a cave without being caged or otherwise confined in some way. Second, adult hamadryads subsist largely on snakes and lizards (Das, 2010), and to our knowledge anurans are not included in the diet. Third, the specific location where these observations reportedly occurred is vague, perhaps purposefully so, making verification difficult, if not impossible. Whether or not snake ceremonies persist in Shan State remains an open question as security concerns and travel restrictions preclude field research throughout much of this region.

Considerable speculation surrounds the origins of the snake ceremonies witnessed by travelers to pre-war Burma. Davis (1940) suggested Burmese “snake worship” had its genesis

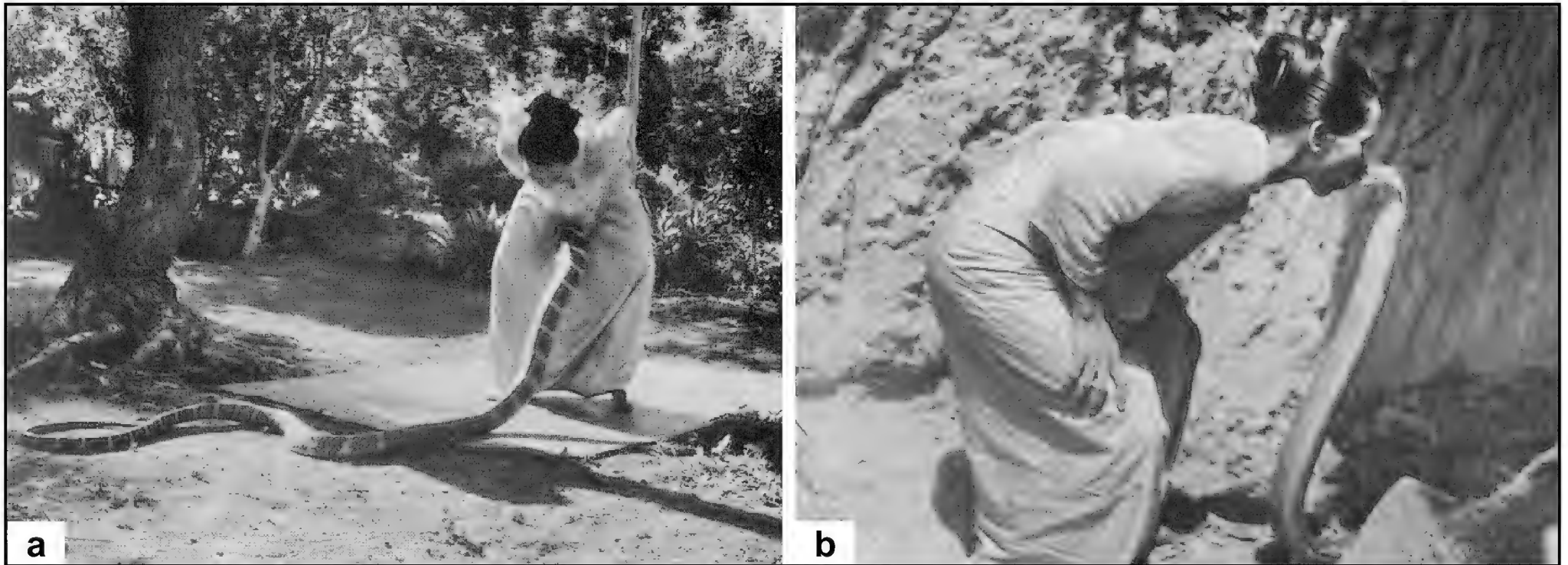


Figure 3. A ritual described as “snake worship” involving a large hamadryad (*Ophiophagus hannah*) and a local priestess. The ritual was reportedly filmed in Shan State, Myanmar, although the specific locality cannot be determined. During the ritual, a hamadryad lunges towards the priestess, biting the loose folds of her skirt (a). When the snake tires, the priestess leans forward, kissing its mouth and culminating the ritual (b). Photographs from Davis (1940).

either in India or among the Khmer rulers of ancient Cambodia and Thailand. The involvement of women in the Burmese rituals is apparently unique among ethnic snake charmers in the region, leading Minton and Minton (1980) to conclude their participation pointed to a Khmer origin, because Khmer kings claimed descent from a Naga princess who married an exiled Indian prince.

Owing to a lack of sufficient detail in the original accounts (Gillespie, 1938; Davis, 1940; Outram, 1946; Denis, 1963), the snake rituals of Burma are difficult to place in a religious or cultural context. Assuming these practices are indeed grounded in religious beliefs, we question their characterization as “snake worship” and propose an alternate interpretation. We contend it was the Nats rather than the snakes that were being worshiped; villagers probably believed the hamadryads were protected by local Nats, and viewed the rituals as a vehicle for appeasing the latter. We encountered similar rituals while conducting field research on tortoises (*Geochelone platynota* and *Indotestudo elongata*) in central Myanmar (Platt et al., 2003, 2011). In certain localized areas tortoises are believed to be under the protection of Nats associated with a nearby mountain or hill. To harm or even unduly disturb a tortoise is to risk offending the Nats and incurring divine retribution in the form of misfortune, sickness, and even death. Prior to initiating field surveys, we were asked by villagers to participate in ceremonies conducted by a local shamaness who made offerings to the Nats to con-

vince them of our good intentions. In this case (and probably with hamadryads as well), the Nats rather than the tortoises were the objects of veneration. The well-being of the tortoises was respected merely because these animals are believed to be favored by the Nats. However, because the historical record is largely silent on the cultural and religious significance of snake rituals, and these practices apparently no longer continue, the cobra cults of Burma are unlikely to ever be fully understood.

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Notes on the Herpetofauna of Western Mexico 6: Amphibians and Reptiles of Hostotipaquillo, Jalisco, Mexico

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Abstract

Sampling of amphibians and reptiles was conducted in the municipality of Hostotipaquillo in the northern part of the state of Jalisco. After six months of fieldwork 60 species were registered. This field work was conducted to determine the previously undocumented species richness of the municipality.

Resumen

Se realizó el muestreo de herpetofauna en el municipio de Hostotipaquillo en el estado de Jalisco con la finalidad de incrementar el conocimiento en cuanto a la riqueza de estos grupos. Después de seis meses de muestreo se registraron 60 especies. Este trabajo se realizó con la finalidad de dar a conocer la diversidad de anfibios y reptiles de este municipio poco conocido.

Introduction and Background

Mexico is recognized for its richness in amphibian and reptile species, and Jalisco contributes an important number of species to this diversity. It is seventh out of 32 states in terms of herpetofaunal richness, with circa 200 species of amphibians and reptiles (Cruz-Sáenz et al., 2009a). Tropical deciduous forest is the biome with the highest richness in reptiles in Jalisco (Cruz-Sáenz, 2009b). The state is politically divided into 125 municipalities. A number of important papers have been published on Jalisco's herpetofauna: Casas-Andreu (1982) and García and Ceballos (1994) surveyed the herpetofauna of the coastal area of the state, and Ramírez-Bautista (1994) worked in the area of Chamela-Cuixmala Biosphere Reserve.

Documenting Mexico's herpetological richness has received increasing attention in recent years with the publication of numerous scientific articles and books, including: amphibians and reptiles of Aguascalientes (Vázquez-Díaz and Quintero-Díaz, 2005); amphibians and reptiles of Coahuila (Lemos-Espinal and Smith, 2007a); amphibians and reptiles of Chihuahua (Lemos-Espinal and Smith, 2007b); herpetofauna of Valle de México (Ramírez-Bautista et al., 2009); the Bufonidae of Mexico (Oliver-López et al., 2009); snakes of Nuevo León (Lazcano et al., 2010); biodiversity of Sonora (Molina-Freaner and Van Devender, 2010); amphibians and reptiles of Valle de Tehuacán-Cuicatlán (Canseco-Márquez and Gutiérrez-Mayén, 2010); amphibians and reptiles of Querétaro (Dixon and Lemos-Espinal, 2010). Many of the herpetological activities conducted in the country are documented in the abstracts of the Mexican Herpetological Society meetings that have occurred since the early '80s, including 2006 (Monterrey), 2008 (Pachuca), 2010 (Toluca).

The Santiago River which crosses the southern part of the municipality of Hostotipaquillo has been impacted by a series of hydroelectric plants: Aguamilpa (1994); El Cajón (2007) in Nayarit and Santa Rosa (1964); La Yesca (2012) in Jalisco,

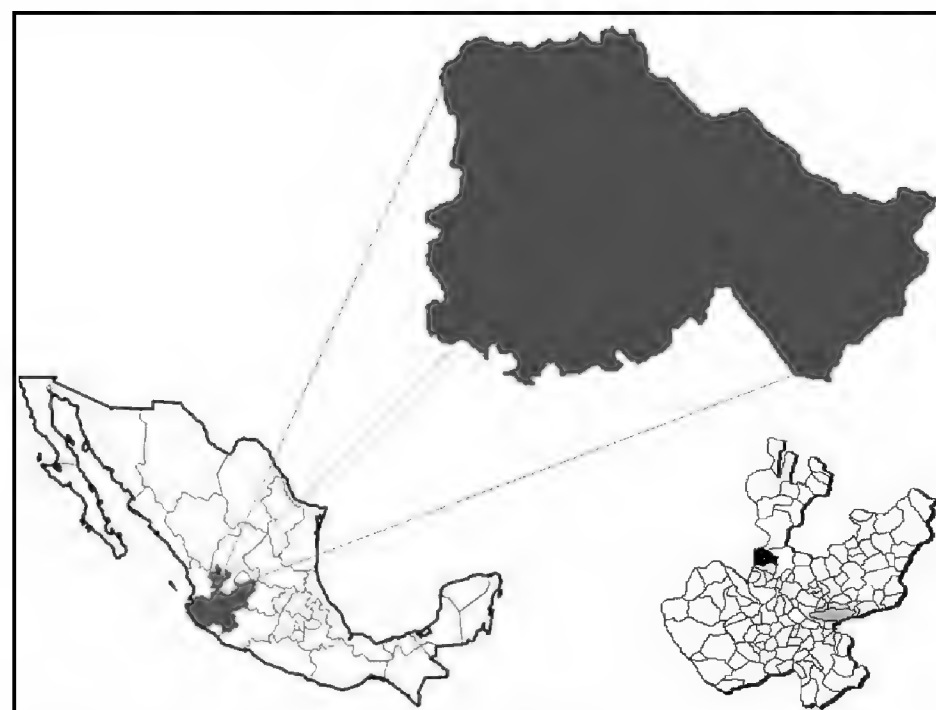
interrupting its flow to the Pacific Ocean.

In this article we contribute to our better understanding of Jalisco herpetofauna, extending our knowledge on herpetological patterns of distributions throughout the state. We include a checklist of our study site in the municipality of Hostotipaquillo.

Understanding the vertebrate diversity at the site is important for management and conservation actions, issues and programs. It may extend our number of areas dedicated the preservation and conservation of species that could fall in any category within the Mexican Wildlife Laws.

Study Area

The municipality of Hostotipaquillo is located in the northern region of Jalisco, with a surface area of 697.94 km², which represents 0.969% of Jalisco's territorial surface. It's about 100 km from Guadalajara, traveling on the Federal Highway #15; the study area is bordered by the municipalities of Tequila to east



Location of the municipality of Hostotipaquillo.

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A view of tropical deciduous forest in the valley of the Santiago River. Photograph by Daniel Cruz-Sáenz.

and Magdalena to the south in Jalisco. The Santiago River is a natural border between the municipalities of Hostotipaquillo/Magdalena and the municipality of Ixtlán del Río in Nayarit to the west. By the time the river crosses these municipalities it has been impacted by Hydroelectric Plant La Yesca located between the municipalities of La Yesca (Nayarit) and Hostotipaquillo (Jalisco).

Hostotipaquillo has several vegetation types: tropical deciduous forest, thorn scrub, oak forest, pine-oak forest, natural and induced grasslands, secondary vegetation and agricultural lands. The dominant vegetation is the tropical deciduous forest (INEGI, 1981).

Methods

Our survey was conducted for a period of six months in the different vegetation types of the municipality of Hostotipaquillo, Jalisco. Before starting our survey we checked for previous herpetological documentation/articles/databases of the municipality. The selection of sites were made using a grid and randomizing the squares of the grid. This divided the municipality into measurable squares that were used as transects of one km².

In each transect we surveyed in all the probable microsites



A juvenile *Ctenosaura pectinata*. Photograph by Daniel Cruz-Sáenz.



An oak forest in the municipality of Hostotipaquillo, Jalisco. Photograph by Daniel Cruz-Sáenz.

that amphibians and reptiles could use or be found in: logs, rocks, trees, ground, leaf litter, anthropogenic cover, etc.

Results

Our surveys provide additional baseline distribution data for the diversity of amphibians and reptiles of municipality of Hostotipaquillo. The documented herpetofauna consists of 60 species, of which 20 are amphibians and 40 are reptiles (see Table 1). Four had been previously reported (Cruz-Sáenz, 2004): *Lithobates catesbeianus*, *Lithobates berlandieri*, *Coluber flagellum* and *Trimorphodon biscutatus*.

Amphibian species were grouped in one order, six families and 11 genera. Of these, 10 species are endemic to Mexico and four are protected by the Mexican law NOM-SEMARNAT-059-2010.

Reptile species were grouped in two orders, 14 families and 26 genera. Of these, 18 species are endemic to Mexico and 16 are protected by the Mexican law NOM- SEMARNAT-059-2010.

The families that present the largest number of species of amphibians are Ranidae and Craugastoridae, and of reptiles are Colubridae and Phrynosomatidae.



Crotalus basiliscus taking refuge in a rocky canyon. Photograph by Daniel Cruz-Sáenz.

Table 1. Amphibian and reptile species from Hostotipaquillo. Protection categories based on Norma Oficial Mexicana (NOM-SEMARNAT-059-2010): A = Amenazada (Threatened), P = En Peligro (Endangered), Pr= Protección Especial (Special concern). Endemism status: EM= Endemic to Mexico. Empty circles○ indicate species previously recorded. Filled circles ● are records from this project. Nomenclature from Flores-Villela and Canseco-Márquez (2004) and Liner and Casas-Andreu (2008).

Species	Common name	Protection category	Endemism	Record
Amphibians				
<i>Ollotis mazatlanensis</i>	Sinaloa Toad	—	EM	●
<i>Ollotis occidentalis</i>	Pine Toad	—	EM	●
<i>Rhinella marina</i>	Cane Toad	—	—	●
<i>Syrhophus modestus</i>	Blunt-toed Chirping Frog	Pr	EM	●
<i>Syrhophus nitidus</i>	Shiny Peeping Frog	—	EM	●
<i>Craugastor augusti</i>	Barking Frog	—	EM	●
<i>Craugastor hobartsmithi</i>	Smith’s Pigmy Tropical Frog	—	EM	●
<i>Craugastor occidentalis</i>	Taylor’s Barking Frog	—	EM	●
<i>Hyla arenicolor</i>	Canyon Treefrog	—	—	●
<i>Hyla eximia</i>	Mountain Treefrog	—	—	●
<i>Pachymedusa dacnicolor</i>	Mexican Leaf Frog	—	EM	●
<i>Smilisca baudinii</i>	Mexican Treefrog	—	—	●
<i>Smilisca fodiens</i>	Lowland Burrowing Treefrog	—	—	●
<i>Spea multiplicata</i>	Mexican Spadefoot	—	—	●
<i>Hypopachus variolosus</i>	Sheep Frog	—	—	●
<i>Lithobates berlandieri</i>	Rio Grande Leopard Frog	—	—	○
<i>Lithobates catesbeianus</i>	American Bullfrog	—	—	○
<i>Lithobates forreri</i>	Forrer’s Leopard Frog	Pr	—	●
<i>Lithobates megapoda</i>	Big-footed Leopard Frog	Pr	EM	●
<i>Lithobates neovolcanicus</i>	Transverse Volcanic Leopard Frog	A	EM	●
Reptiles				
<i>Elgaria kingii</i>	Madrean Alligator Lizard	A	—	●
<i>Phyllodactylus lanei</i>	Lane’s Leaf-toed Gecko	—	EM	●
<i>Phyllodactylus tuberculosus</i>	Yellow-bellied Gecko	—	—	●
<i>Ctenosaura pectinata</i>	Western Spiny-tailed Iguana	A	EM	●
<i>Heloderma horridum</i>	Beaded Lizard	A	—	●
<i>Sceloporus albiventris</i>	White-bellied Spiny Lizard	—	EM	●
<i>Sceloporus clarkii</i>	Clark’s Spiny Lizard	—	—	●
<i>Sceloporus heterolepis</i>	Odd-scaled Spiny Lizard	—	EM	●
<i>Sceloporus horridus</i>	Rough Lizard	—	EM	●
<i>Sceloporus melanorhinus</i>	Black-nosed Lizard	—	—	●
<i>Sceloporus scalaris</i>	Light-bellied Bunchgrass Lizard	—	—	●
<i>Sceloporus utiformis</i>	Large-scaled Spiny Lizard	—	EM	●
<i>Urosaurus bicarinatus</i>	Tropical Tree Lizard	—	EM	●
<i>Norops nebulosus</i>	Clouded Anole	—	EM	●
<i>Aspidoscelis communis</i>	Giant Whiptail	Pr	EM	●
<i>Aspidoscelis costata</i>	Western Mexico Whiptail	Pr	EM	●
<i>Aspidoscelis gularis</i>	Texas Spotted Whiptail	—	—	●
<i>Aspidoscelis lineatissima</i>	Many-lined Whiptail	Pr	—	●
<i>Plestiodon callicephalus</i>	Mountain Skink	—	—	●
<i>Boa constrictor</i>	Boa Constrictor	A	—	●
<i>Coluber bilineatus</i>	Sonoran Whipsnake	—	—	○
<i>Coluber flagellum</i>	Coachwhip	A	—	●

Table 1 (cont'd)

Species	Common name	Protection category	Endemism	Record
<i>Coluber mentovarius</i>	Neotropical Whipsnake	—	—	●
<i>Drymarchon melanurus</i>	Central American Indigo Snake	—	—	●
<i>Drymobius margaritiferus</i>	Speckled Racer	—	—	●
<i>Hypsiglena torquata</i>	Collar Nightsnake	Pr	—	●
<i>Lampropeltis triangulum</i>	Milksnake	A	—	●
<i>Manolepis putnami</i>	Thin-scaled Snake	—	EM	●
<i>Pantherophis emoryi</i>	Great Plains Ratsnake	—	—	●
<i>Oxybelis aeneus</i>	Brown Vinesnake	—	—	●
<i>Salvadora mexicana</i>	Mexican Patch-nosed Snake	Pr	EM	●
<i>Tantilla bocourti</i>	Bocourt's Black-headed Snake	—	EM	●
<i>Tantilla calamarina</i>	Pacific Coast Centipede Snake	Pr	EM	●
<i>Thamnophis cyrtopsis</i>	Black-necked Gartersnake	A	—	●
<i>Trimorphodon biscutatus</i>	Western Lyresnake	Pr	—	○
<i>Trimorphodon tau</i>	Mexican Lyresnake	—	EM	●
<i>Micrurus distans</i>	Western Mexican Coral Snake	Pr	EM	●
<i>Crotalus basiliscus</i>	Mexican West Coast Rattlesnake	—	EM	●
<i>Ramphotyphlops braminus</i>	Brahminy Blindsnake	—	—	●
<i>Kinosternon integrum</i>	Mexican Mud Turtle	Pr	EM	●

Discussion

This project increased the documented herpetological richness of the municipality to 60 species.

A great number of species are under a protection regime (20) and many (28) are endemic to Mexico. It is important to continue fieldwork in order to determine the conservation status of populations that inhabit this municipality and to implement actions conducive to the preservation of all herpetofauna (Cruz-Sáenz, 2004).

Even though the municipality is bordered to the south by the Santiago River, which has been impacted by a hydroelectric plant, the positive or negative effects on herpetofauna have not been quantitatively evaluated here or in any part of Mexico, as they have been in other countries (Dettman 2005; Iftime 2005; Brandão and Araújo, 2008; Hayes and Jennings, 1986; Jennings, 1988; Lind et al., 1996; McLeod et al., 2011; Moyle, 1973).

Dams are very important sources of electric power that benefits a large number of people; their construction is a vital strategy for any nation. To the states of Jalisco and Nayarit the effects of dams on wildlife come in second when human population is at stake. Dams will probably continue being built; this is something essential for our nation. We should do our best to construct more dams that are in harmony with the environment and provide ecological services. Enhanced water reserves are an indirect effect of dams. They may also supply water for irrigation, direct human consumption and ecotourism.

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Sceloporus utiformis. Photograph by Daniel Cruz-Sáenz.



Pachymedusa dacnicolor. Photograph by Daniel Cruz-Sáenz.

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A Brief Note on Reproduction in Morelet's Leaf Frog, *Agalychnis moreletii* (Duméril)

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Fecundity levels are highly variable among amphibians and are most closely associated with reproductive modes and body size within reproductive modes (Duellman and Trueb, 1986). The phyllomedusine hylids of the genus *Agalychnis* are often explosive breeders; during favorable conditions they frequently congregate en masse, depositing clutches of eggs on vegetation and rocks above bodies of water. Hatching tadpoles later fall into the water to complete their development. Among the *Agalychnis* species, reported clutch sizes are 11–108 eggs in *A. callidryas*, 47–162 eggs in *A. annae*, 14–67 eggs in *A. spurrelli*, 23–85 eggs in *A. moreletii*, and 21–79 in *A. saltator* (Duellman, 2001). These numbers don't necessarily reflect, however, the total reproductive output of a female over the course of one evening. In a recent study in Belize, Briggs (2007) found that females typically produce a number of "sub-clutches" while in amplexus with a single male. After each sub-clutch is deposited, the female will descend to the water to refill her bladder before laying the next complement of eggs. The number of eggs deposited in one evening from these sub-clutches may total 200–250 eggs in *A. callidryas* and 300–350 eggs in *A. moreletii* (Briggs, 2007).

Morelet's or black-eyed leaf frogs (*A. moreletii*) are moderately large (to 82.9 mm) hylids distributed from southern Mexico to central El Salvador. Inhabiting humid lowland to montane forests (450–2130 m), *A. moreletii* occurs in both pristine and disturbed habitat, and individuals are generally found during the day on the surfaces of leaves (Campbell, 1998; Duellman, 2001). It is considered critically endangered and has recently been afforded CITES protection under Appendix II.

On 29 May 2010, a captive 78 mm female *A. moreletii* deposited a total of 359 eggs in what appeared to be a composite of several successively laid and adjoined "sub-clutches" adhered to the side of a large glass enclosure. Clutch size was later determined by counting the number of tadpoles (332) found in the water below and then counting infertile eggs (27) left in the gelatinous egg mass. Another clutch deposited in August 2010 by an *A. moreletii* was estimated to have numbered over 200 eggs, many of which were infertile. These observations provide further evidence that the reproductive potential of this species over the course of a single evening may be particularly higher than what single clutch counts might suggest.

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Herpetology 2012

In this column the editorial staff presents short abstracts of herpetological articles we have found of interest. This is not an attempt to summarize all of the research papers being published; it is an attempt to increase the reader's awareness of what herpetologists have been doing and publishing. The editor assumes full responsibility for any errors or misleading statements.

PROTECTING BLANDING'S TURTLES

J. D. Congdon et al. [2011, Canadian Journal of Zoology 89(11):1098-1106] documented sizes of terrestrial protection zones around wetlands that are necessary to protect all of the core area of Blanding's turtles (*Emydoidea blandingii*) on the Edwin S. George Reserve (ESGR) in southeastern Michigan. Data collected over three decades indicated that 39% of the 83 females and 50% of the 60 males maintained the same residence wetland for more than 20 years, and 33% of the 182 nonresident females used nesting areas on the ESGR for more than 20 years. Approximately 20% of resident males and females were captured in 21 temporary wetlands on the ESGR. Nesting areas were located from 100 to 2000 m from residence wetlands, and some of 45 females (18%) used up to six different nesting areas, some separated by >1000 m. Terrestrial protection zones 300 and 450 m around all wetlands (residence and temporary) protect 90% and 100% of nests, respectively. Terrestrial protection zones of 300, 1000, and 2000 m around residence wetlands only are required to protect 14%, 87%, and 100% of adults, respectively. A protection zone that encompasses the activities of most or all Blanding's turtles has a high probability of including the core areas of most other semiaquatic organisms.

ROAD SALT AND TREEFROG TADPOLES

E. K. Dobbs et al. [2012, Herpetologica 68(1):22-30] note that salinization of aquatic habitats is an emerging environmental concern, especially in colder climates where salt is used to prevent road icing during winter months. Salt applied to roads is carried into aquatic environments in storm-water runoff, where fluctuating water levels can result in salt stratification and spatially complex exposure scenarios for embryonic and larval pond-breeding amphibians. The authors experimented to investigate the potential interaction between oviposition site selection and toxicity of road salt to embryonic Cope's gray treefrogs (*Hyla chrysoscelis*). They simulated road-salt stratification in 7-liter microcosms containing sediment from a salt-contaminated pond and placed developing eggs at three water depths and directly on the sediment of the microcosms. At the beginning of the experiment, conductivity at the bottom of the microcosms was four to seven (from 4.0 to 6.5 mS cm⁻¹) times higher than at the top or middle of the water column (1.0 mS cm⁻¹). Subsequently, survival of eggs placed near the bottom and on the bottom of buckets containing salt-contaminated sediment was near 0%, while survival of eggs at the top and middle depths of the contaminated microcosms, and at all depths in control microcosms, was >60%. After hatching, embryos avoided the bottom of contaminated buckets even though much of the vertical salt gradient had dissipated. In contrast, embryos in control buckets clustered at the bottom. These results suggest that pond-breeding amphibians that place their eggs away from the bottom may avoid some of the toxic effects of salt contamination, and those that place eggs on the bottom may be at particularly high risk.

SALTIES EATING SEA TURTLES

S. D. Whiting and A. U. Whiting [2011, Chelonian Conservation and Biology 10(2):198-205] describe predation tactics used by saltwater crocodiles (*Crocodylus porosus*) on flatback sea turtles (*Natator depressus*) and olive ridley sea turtles (*Lepidochelys olivacea*) on nesting beaches in northern Australia. For adult turtles, crocodiles used both a sit-and-wait tactic in which they attacked a turtle at the water's edge after it completed nesting and an active hunting strategy in which crocodiles followed turtle tracks into the dunes to attack turtles at nest sites. Saltwater crocodiles also hunted sea turtle hatchlings in the dunes and excavated a sea turtle nest and consumed the eggs. The protection of saltwater crocodiles in Australia starting in the early 1970s has led to increased population sizes and a greater proportion of larger individuals. This likely has resulted in increased predation rates on sea turtles over several decades, which should be considered as an important mortality component for some tropical nesting aggregations.

TADPOLE BUOYANCY

J. H. Gee and S. L. Rondeau [2012, Herpetologica 68(1):3-13] measured gaseous lift and specific gravity of larval anurans at regular intervals during development to assess their importance in determining buoyancy in eight species. Specifically, they examined the hatchling, larval, and metamorphic stages of tadpoles from still waters (*Limnodynastes dumerili*, *Limn. peronii*, *Lithobates septentrionalis*, and *Rhinella marina*), intermittent streams (*Litoria genimaculata* and *Lito. lesueuri*), and torrent sections of rivers (*Lito. nannotis* and *Nyctimystes dayi*). Buoyancy levels and the strategies used to attain buoyancy varied at different phases of development and with the environment occupied. Buoyancy increased rapidly during development in hatchlings of *Limn. peronii*, *Lith. septentrionalis*, and *R. marina* due to a reduction in specific gravity. Lungs were inflated in early larval stages of all species except for *Lito. nannotis*, *N. dayi*, and *R. marina*, which inflated their lungs following metamorphosis. *Limnodynastes dumerili* and *Limn. peronii* used gaseous lift to maintain near-neutral buoyancy throughout larval and metamorphic stages. *Lithobates septentrionalis*, Stages 25–29 (first summer), possessed a high level of gaseous lift, but buoyancy declined as lung gas volume decreased in Stages 31–43 (second summer). *Rhinella marina* did not inflate lungs prior to transformation but achieved an intermediate buoyancy level due to a very low specific gravity. The intermittent-stream species *Lito. genimaculata* and *Lito. lesueuri* used gaseous lift to achieve buoyancy levels similar to those of *Lith. septentrionalis* (Stages 31–43) and *R. marina*. The torrent-dwelling species *Lito. nannotis* and *N. dayi* were the least buoyant; their lungs were not inflated prior to transformation and their specific gravity was elevated. Both gaseous lift and specific gravity are important factors in determining buoyancy in larval anurans.

SALT TOLERANCE BY CRAB-EATING FROGS

W.-T. Hsu et al. [2012, *Herpetologica* 68(1):14-21] report that previous studies have shown that the tadpoles of crab-eating frogs, *Fejervarya cancrivora*, were salt-tolerant (up to 24 parts per thousand [ppt] in the field and 35 ppt in the laboratory) but metamorphosed only at or below 6.6 ppt. They hypothesized that the discrepancy in salt tolerance is due to results drawn from short- and long-term experiments and different acclimation procedures, which needed to be re-examined. They compared the salinity tolerance of acclimated and nonacclimated tadpoles and assessed salinity effects on growth, development and metamorphosis among tadpoles of *F. cancrivora* throughout the larval period. Experiment 1 determined 48-h tadpole survivorship by assigning 40 tadpoles to one of 24 treatments ranging from 3-ppt to 30-ppt salinity. Experiment 2 assigned tadpoles to 3- to 15-ppt salinity at intervals of 3 ppt and monitored growth and development. Experiment 3 exposed 15 tadpoles to a stepwise increase of salinity (2 ppt every 3 d) and monitored the tadpole survivorship and metamorphic success. Experiment 1 estimated LC_{50} (the salt concentration that kills 50% of tadpoles within 48 h) at 13.7 ppt and tadpoles survived for 48 h at salinities as high as 16 ppt, suggesting that saline tolerance of *F. cancrivora* tadpoles is greater than any other anuran species studied to date. In Experiment 2 only tadpoles in 3, 6, and 9 ppt survived to metamorphosis. Tadpoles at 9 ppt grew and developed slower than in lower salinities during the first 7 wk, but the time to and size at metamorphosis were similar among treatments, suggesting that tadpoles were stressed at 9 ppt early, but probably were able to catch up growth after a period of adjustments. In Experiment 3 all tadpoles survived through 18 d as the salinity was increased stepwise from 3 ppt to 15 ppt, and 6 of 15 tadpoles were able to metamorphose at high salinities (17–21 ppt). This contradicts earlier results suggesting tadpoles could metamorphose only at salinities ≤ 6.6 ppt. Overall results showed that *F. cancrivora* tadpoles not only tolerate salt well, but also can acclimate to higher salinities. This ability to acclimate could free tadpoles from dependence on the occurrence of rain to facilitate metamorphosis, and thus represents an adaptation to the unpredictable nature of salinity variation in brackish habitats.

A NEW SPECIES OF CHAMELEON

E. Greenbaum et al. [2012, *Herpetologica* 68(1):60-75] note that the recently erected chameleon genus *Kinyongia* currently includes 17 species, with the majority occurring in montane regions of East Africa. *Kinyongia adolfifriederici* is one of only three species in the genus to occur in Central Africa, with numerous populations occurring from low- to high-elevation forests of the Albertine Rift. Recent fieldwork in the Lendu Plateau in northeastern Democratic Republic of the Congo (DRC) led to the discovery of a population of chameleons that is significantly larger than and morphologically distinct from the closely related species *K. adolfifriederici*, which was described from the lowland Ituri forest, DRC. Analyses of mitochondrial and nuclear DNA sequences revealed that *K. adolfifriederici* is a complex of cryptic species. The authors describe the Lendu population as a new species, *Kinyongia gyrolepis*, underscoring the endemism and conservation importance of this poorly known, unprotected montane region.

GREEN SEA TURTLES IN SAN DIEGO BAY

T. Eguchi et al. [2012, *Herpetologica* 68(1):76-87] studied morphology and somatic growth rate of green sea turtles, *Chelonia mydas*, living in San Diego Bay, California; one of the northernmost foraging areas for the species in the eastern Pacific. A power plant had discharged heated effluent into the urbanized bay from 1960 to 2010. Straight carapace lengths of 101 green sea turtles were recorded from 31 March 1990 to 15 April 2011 (45.4 to 110.4 cm). Green sea turtles in San Diego Bay were morphologically indistinguishable from those foraging in Baja California Sur, Mexico. The median growth rate was 1.03 cm/yr (-1.6 to 11.4 cm/yr) for all turtles and was 4.9 cm/yr for turtles ≤ 90 cm. These growth rates were one of the fastest for the species in temperate areas and comparable to those reported for tropical regions. Based on behavioral observations and information from other diet studies, the authors think that the altered environment from the power plant effluent affected the growth of the green sea turtles directly (longer active periods) and via shifts in the environment (changes in prey composition, abundance, and distribution). With the termination of the power plant operation at the end of 2010, the ecosystem is reverting to its natural state, which the authors expect will result in decreased growth rates of these turtles in the coming years.

GRASS SNAKE POPULATION DIFFERENTIATION

B. Meister et al. [2012, *Herpetologica* 68(1):134-145] note that the loss and fragmentation of pristine habitat restrict specialized species to remnants of original habitat patches in a less suitable landscape. This may lead to a genetic differentiation of the subpopulations and to a decline in biodiversity. Seven microsatellite markers were used to examine the genetic population structure of grass snakes, *Natrix natrix*, sampled in remnants of pristine habitat in a former wetland in the Swiss lowlands and in a rural valley in the Alps. On a regional level, the population structures of *N. natrix* in these two areas were compared with that of grass snakes living in an intensively used agricultural area. The three study areas were 30–100 km apart, but were interconnected by the river Aare. At the local scale, no genetic differentiation was found in either of the *N. natrix* populations inhabiting the rural alpine valley or the intensively used agricultural area. However, two subpopulations in the former wetland area were genetically differentiated with low but significant differentiation between them. This slight differentiation can be explained by isolation by distance. At the regional scale, significant genetic differentiation was found between *N. natrix* populations inhabiting areas separated by 30–100 km. Genetic structure was highly related to isolation by distance with 85% of the among-populations genetic variance explained by the geographical distance. Euclidean distance explained genetic differentiation of grass snake populations better than distance following watercourses. These findings indicate regular gene flow between *N. natrix* subpopulations and show that this species also moves across intensively used terrestrial habitat. The genetic structure of grass snakes is mainly affected by geographic distance, while human activity and habitat alteration do not seem to reduce the snakes' movements. The results suggest that conservation in human-altered landscapes should focus on the maintenance of a habitat mosaic with anuran breeding ponds and adequate oviposition sites.

The Tympanum

When People Ask Why You Keep Reptiles, Tell Them

Every reptile keeper is familiar with it: Total incomprehension on the part of non-herpers as to why we keep the pets we do.

While others are off in Washington doing their work fighting this battle on the legislative front, the rest of us have our own battles to fight. I issued a **challenge to the members** of the reptile community in December to do education in libraries, schools, and public events like pet fairs, but we also need to do one-on-one education about the beauty and wonder of our chosen species.

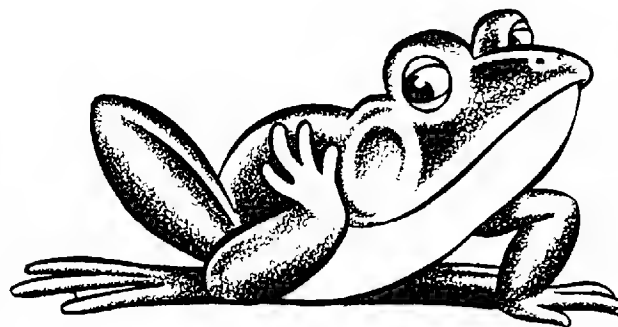
Start by sharing with skeptical members of the public how beautiful you find animals like snakes. Their fluid movements, grace, and beauty enthrall me each and every day I am with them. Their bodies are amazing mechanically; their muscle movements enchant me.

We need to help people understand that yes, we have relationships with our snakes. I talk to each one that lives with me, calling them by name even though they never answer back. These are beautiful, low maintenance pets who make me smile each day; what could be wrong with that?

My lizards are much more personable. Osama answers to his name and is clearly my favorite. He greets me with a series of head-bobs communicating his mood, much like a dog does with his tail.

I train my dogs, and I've also trained my lizards. Using treats to reward the behavior I want, I have successfully trained Osama to go where I want him to and remain hands free if I wish. He responds to my voice, not in the same way as my dogs, but in his own way. It's clear he recognizes my voice. He also responds to my touch and often reaches out to be held.

No, my reptiles don't follow me around the house like my dogs. They don't share scraps off my plate or cuddle with me on the couch—but neither does my cat.



You may think you shouldn't have to explain to people that your pets are great animals and that you aren't a "freak" for keeping them. You're right; in a perfect world, that would be true. But in case you haven't noticed, this isn't a perfect world, and the more we get average pet-owners to understand that we love, respect and admire our reptile pets, the easier it will be to get them to oppose laws that would take our



Cindy with Osama Binguana, her beloved Grand Cayman hybrid iguana.

pets away or irrationally restrict our right to keep them, or to share this wonderful hobby with another generation of herpers.

So the next time you tell someone you keep snakes and they say, "Euwww," don't argue with them; educate them. Start today.

Cindy Steinle [This opinion piece first appeared in Cindy's blog for February 1, 2012, on Kingsnake.com. For more of Cindy's blogs see <http://www.kingsnake.com/blog/authors/7-Cindy-Steinle>]

Unofficial Minutes of the CHS Board Meeting, January 13, 2012

The meeting was called to order at 7:45 P.M. at the Schaumburg Public Library. Board member Deb Krohn absent.

Officers' Reports

Recording Secretary: The December 2011 minutes were read, corrected, and accepted.

Treasurer: The December financial report was presented, discussed and accepted.

Membership Secretary: Mike Dloogatch reported a modest increase in membership over 2011.

Sergeant-at-arms: Greg Brim counted 56 people at the November meeting.

Publications Secretary: Aaron LaForge is working on a calendar of events for the CHS website.

Sergeant-at-arms: Jim Foster reported that the attendance at the December holiday meeting was 76.

Committee Reports

Shows:

- Notebaert, first full weekend of each month
- Chicago Kids Expo, March 3,4
- Project Exploration Dino Dinner, March 9
- Reptile Rampage, Lake Forest, March 11
- Family Pet Expo, Arlington Racetrack, March 16–18
- NARBC Tinley Park, March 17 & 18

Grants: There are many good applications. The committee will meet this month to review them. Mike Dloogatch moved to increase to \$10,000 the amount available to the committee for grant awards in 2012. Lawrence seconded the motion. Discussion emphasized that the full amount available does not have to be used by the committee. The motion passed unanimously.

Old Business

NARBC, Tinley Park: Jason has confirmed that we will have a free table..

Extra General Meeting, June 9: Cindy and Jason are still working on confirmation. Location and speaker info will be in place by February. Promotion will need to start soon

New Business

March board meeting: Because of the show schedule in March, the date of the board meeting has been changed to March 23, and may be held at Wildlife Discovery Center, pending approval.

Closing ReptileFest early on Sunday: A suggestion was made to close fest at 4 on Sunday. After discussion, it was decided to leave the closing time at 5.

Update 'Fest contact list on the website: Aaron will update.

Jason will not be at the February board meeting. Cindy will run the meeting.

Update contact page on website: Aaron will get contact info for new board members up on website.

Jim Foster needs to know the contact info for the person at the Notebaert to whom to report our meeting attendance.

All current board members should have received an invitation to join a Google Group to receive emails.

Donations: The board discussed donating money to other organizations, since 2011 was a good financial year for us. Tabled until May to see how successful 'Fest is. Anyone wishing to submit an organization for consideration should talk to a board member before the May board meeting.

Round Table

Aaron and his wife are expecting their second child this year.

Bobby Delaney has an internship in graphic design with *Herp Nation* magazine.

J.T. Turingan last year at 'Fest heard *Chicago Parent* most often named as the source of info on 'Fest.

Jenny mentioned an article in the *Chicago Tribune* quoting Steve Sullivan.

Mike Dloogatch passed around a newsletter from the Friends of Kankakee stating they had a great year in land acquisition.

Barb Khan saw interesting things on Yahoo: a new snake species and the world's smallest frog.

Lawrence—Herps of the month: January: turtles and tortoises; February: herps in love; March: green herps; April: herp eggs.

Mike Scott: 92 days 'til 'Fest!

Jason urged everyone to check the Facebook page to sign the US ARK petition to stop the new additions to the Lacey Act list of injurious wildlife.

The meeting was adjourned at 9:12 P.M.

Respectfully submitted by recording secretary Jenny Vollman



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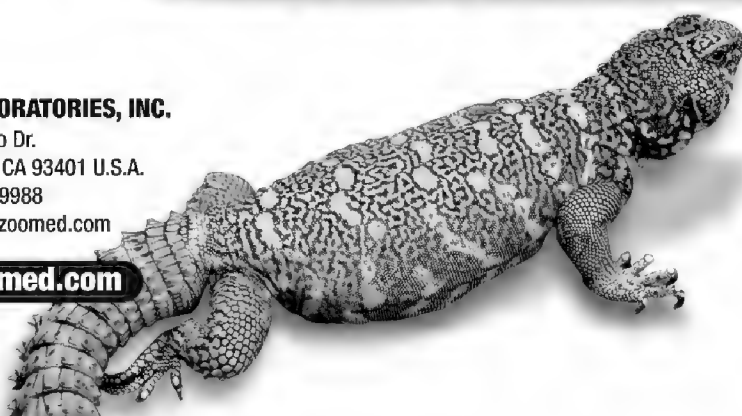
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News and Announcements

2012 CHS GRANT RECIPIENTS

The CHS Grants Committee has chosen the CHS grant recipients for 2012. The committee consisted of John Archer, Michael Dloogatch, Jason Hood, Linda Malawy, Cindy Steinle, Amy Sullivan and Steve Sullivan. This year we received 27 applications, as usual exceeding the number of grants that could be awarded based on available funds. After a difficult decision process, 12 grants were awarded, in varying amounts, as follows:

- Stacy Beyer, Department of Natural Resources and Environmental Sciences, University of Illinois at Urbana-Champaign. “Role of Forests in the Landscape Epidemiology of an Amphibian Chytrid Fungus,” \$500.
- Edwin Cadena, Department of Marine, Earth and Atmospheric Sciences, North Carolina State University. “A New Fossil Turtle from the Early Cretaceous (Barremian-Aptian) of Colombia (South America); Revealing the Early Stages of Marine Turtles Evolution,” \$1,000.
- Chip Cochran, Department of Earth and Biological Sciences, Loma Linda University. “Investigating Venom Variation in *Crotalus mitchellii pyrrhus* across Its Range by Proteomic and Transcriptome Analysis,” \$1,000.
- Forest Preserve District of DuPage County (Dan Thompson, Principal Investigator). “Blanding’s Turtle Recovery Program, DuPage County, Illinois,” \$1,000.
- Joseph Frumkin, University of Illinois at Urbana-Champaign (undergraduate). “The Role of Color Morph on Territoriality in the Red-backed Salamander, *Plethodon cinereus*,” \$1,000.
- Kory H. Heiken, Biological Sciences Department, California Polytechnic State University. “The Physiological Effects of Long-distance Translocation on Southern Pacific Rattlesnakes (*Crotalus oreganus helleri*),” \$500.
- Dustin Owen, Ball State University (undergraduate). “Physiological Impacts of Silviculture Treatments and Roads on Copperheads (*Agkistrodon contortrix*),” \$500.
- Thomas Andrew Radzio, Department of Biology, Drexel University. “Effects of Season and Thermal Environment on Behavioral Thermoregulation and Its Relative Costs in Juvenile Gopher Tortoises,” \$1,000.
- Rebecca Tarvin, Ecology, Evolution and Behavior, The University of Texas at Austin. “Does Alkaloid Insensitivity Facilitate Aposematism and Diet Specialization in Poison Frogs?” \$500.
- Marisa Tellez, Department of Ecology and Evolutionary Biology, University of California, Los Angeles. “Environmental and Anthropogenic Impact on Parasitism between *Alligator mississippiensis* in Florida and Louisiana,” \$500.
- Kyle Weichert, Biological Sciences Department, California Polytechnic State University. “Does Host Lizard Sex Affect Their Ability to Kill the Lyme Disease Causative Agent *Borrelia burgdorferi*?” \$500.
- Andrew William Whitworth, College of Medical, Veterinary & Life Sciences, University of Glasgow. “The Conservation Value of Regenerating Tropical Forests for Amphibians and Reptiles and the Threats Involved, Manu Biosphere Reserve, Southern Peru,” \$500.

ReptileFest 2012

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It’s creeping up on you

UPCOMING MEETINGS

The next meeting of the Chicago Herpetological Society will be held at 7:30 P.M., Wednesday, February 29, at the Peggy Notebaert Nature Museum, Cannon Drive and Fullerton Parkway, in Chicago. The speaker will be **Mike Pingleton** of Champaign, Illinois. Mike, a field herper extraordinaire, will speak on “Herping in Mexico.”

Speaking at the March 28 meeting will be **Marisa Tellez**, a Ph.D. candidate in biology at UCLA. Marisa’s topic will be “The Good, the Bad, and the Ugly — Investigating the Interaction between the American Alligator and Its Parasites.” Marisa’s research is the first in-depth study to investigate the relationships between a crocodilian and its parasites.

The regular monthly meetings of the Chicago Herpetological Society take place at Chicago’s newest museum—the **Peggy Notebaert Nature Museum**. This beautiful building is at Fullerton Parkway and Cannon Drive, directly across Fullerton from the Lincoln Park Zoo. Meetings are held the last Wednesday of each month, from 7:30 P.M. through 9:30 P.M. Parking is free on Cannon Drive. A plethora of CTA buses stop nearby.

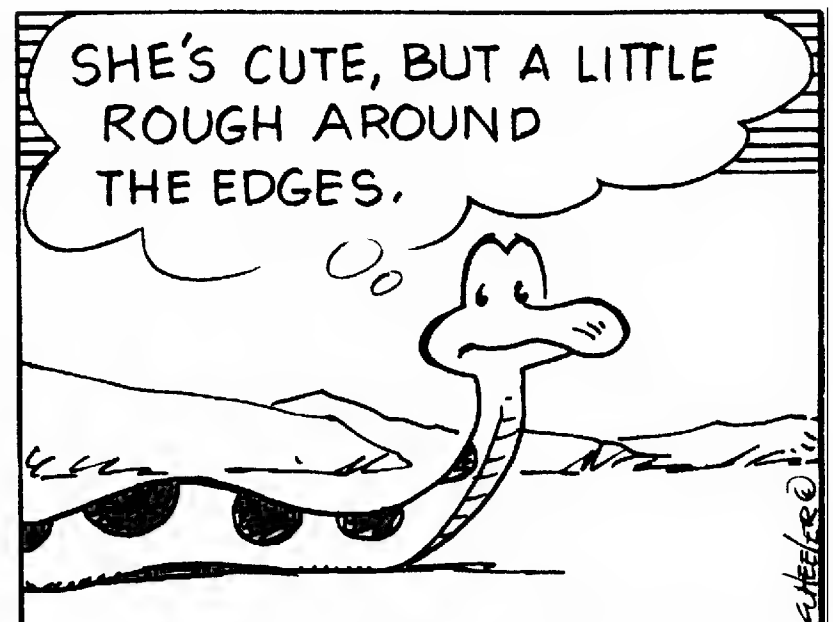
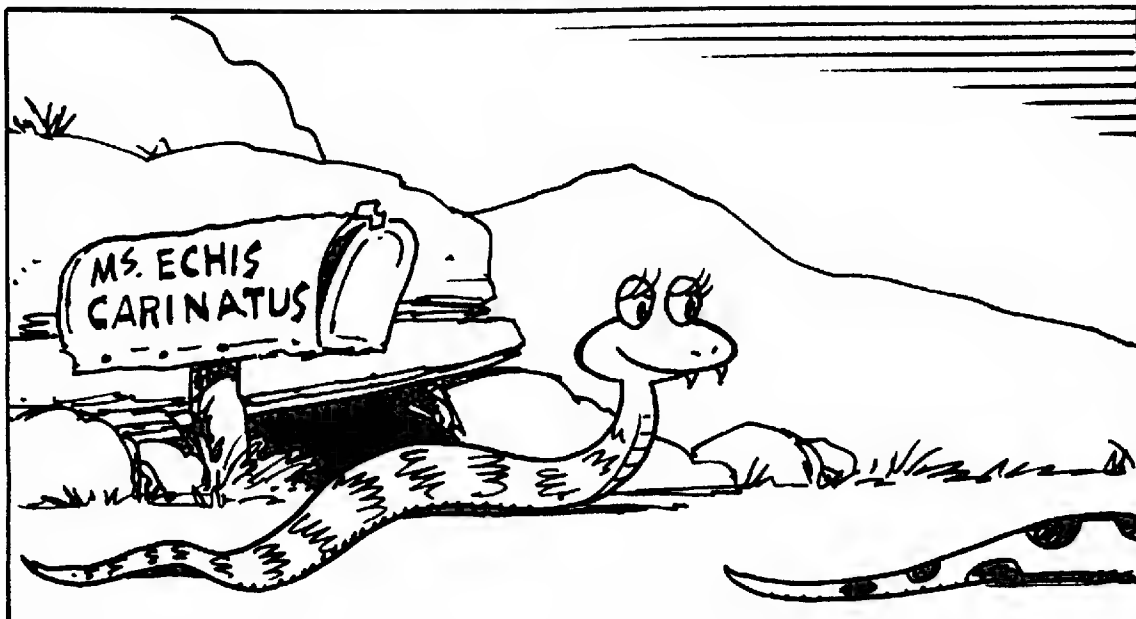
Board of Directors Meeting

Are you interested in how the decisions are made that determine how the Chicago Herpetological Society runs? And would you like to have input into those decisions? If so, mark your calendar for the next board meeting, to be held at 7:30 P.M., March 23, at the Wildlife Discovery Center at Elawa Farms, 1401 Middlefork Drive, Lake Forest, Illinois.

The Chicago Turtle Club

The monthly meetings of the Chicago Turtle Club are informal; questions, children and animals are welcome. Meetings normally take place at the North Park Village Nature Center, 5801 N. Pulaski, in Chicago. Parking is free. For more info visit the group’s Facebook page.

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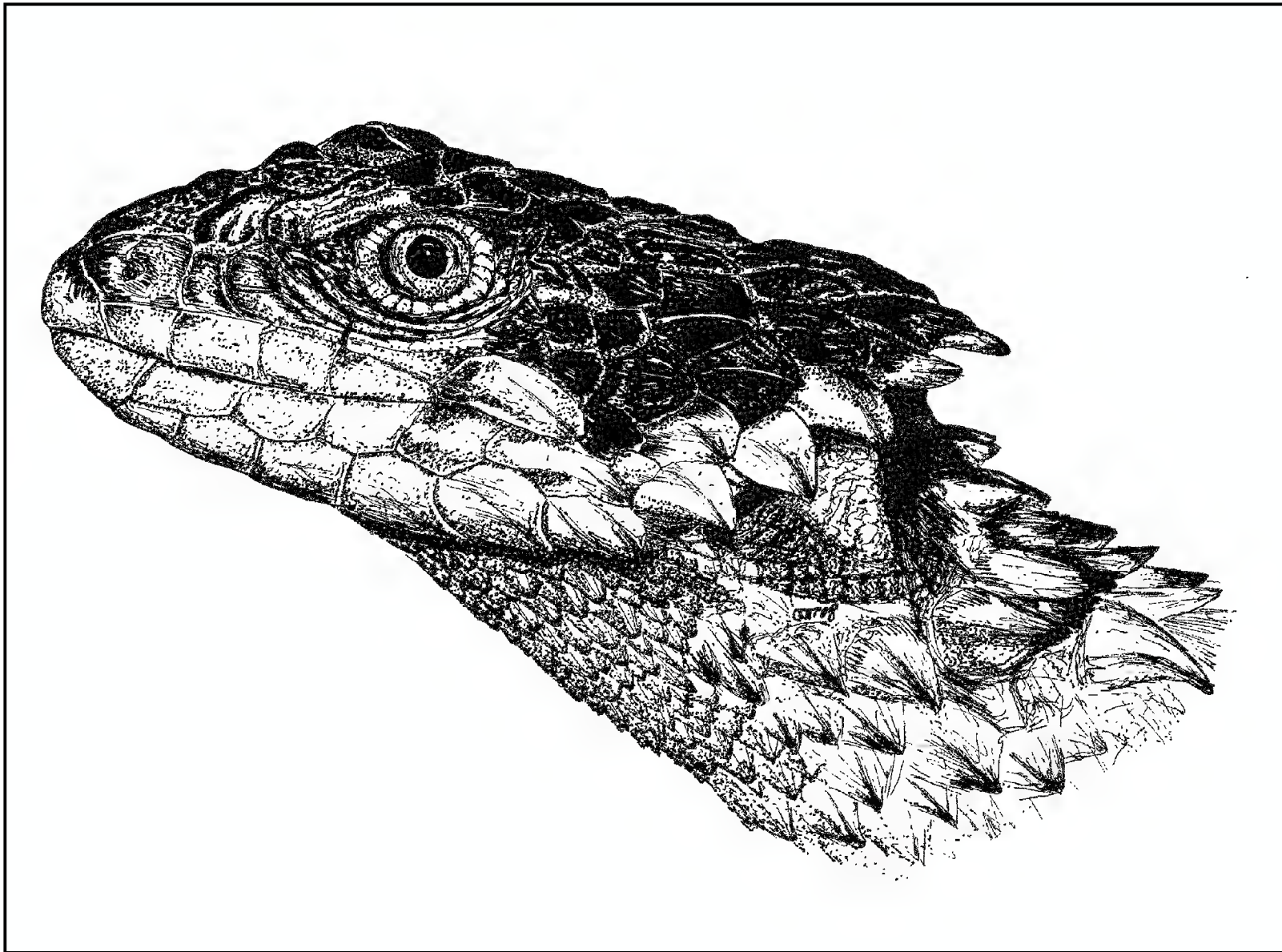
BULLETIN

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Chicago Herpetological Society



Volume 47, Number 3
March 2012



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Armadillo Lizards and Sungazers: The Names Are Changed but the Lizards Remain the Same	Gary Fogel	33
Notes on Reproduction in Roundtail Horned Lizards, <i>Phrynosoma modestum</i> (Squamata: Phrynosomatidae) from New Mexico	Stephen R. Goldberg	34
An Exploration of the Lizard Community at Homolavi State Park with Notes on Predator Signaling in Plateau Fence Lizards	Stephen R. Johnson and Mary Stark	36
What You Missed at the February Meeting	John Archer	38
Herpetology 2012		41
The Tympanum: Requiem for a Lightweight	John Archer	42
Unofficial Minutes of the CHS Board Meeting, February 17, 2012		43
Advertisements		44

Cover: Sungazer lizard, *Smaug giganteus*. Drawing used with the kind permission of the artist, Thomas Guttman, and the *Österreichischen Gesellschaft für Herpetologie*.

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The Chicago Herpetological Society is a nonprofit organization incorporated under the laws of the state of Illinois. Its purposes are education, conservation and the advancement of herpetology. Meetings are announced in this publication, and are normally held at 7:30 P.M., the last Wednesday of each month.

Membership in the CHS includes a subscription to the monthly *Bulletin*. Annual dues are: Individual Membership, \$25.00; Family Membership, \$28.00; Sustaining Membership, \$50.00; Contributing Membership, \$100.00; Institutional Membership, \$38.00. Remittance must be made in U.S. funds. Subscribers outside the U.S. must add \$12.00 for postage. Send membership dues or address changes to: Chicago Herpetological Society, Membership Secretary, 2430 N. Cannon Drive, Chicago, IL 60614.

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Armadillo Lizards and Sungazers: The Names Are Changed but the Lizards Remain the Same

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kordylus@juno.com

In 2011, science felt the need to tamper with the taxonomy of my two favorite lizard species, the armadillo lizards and the sungazers of South Africa. I've seen this happen with other species of lizards throughout the years, but really gave little thought to the process. After all, it never affected my articles or the labor-intensive signs I have carefully created for educational purposes. But now science has finally come knocking on my door with a classy name change to better describe and exemplify these two species. I was totally unaware of this change until this week, when it was brought to my attention. I thought this knowledge important enough to share it in this brief article, so we might all be brought up to speed, scientifically.

The armadillo lizard, previously known for decades as *Cordylus cataphractus*, is now *Ouroborus cataphractus*. This name

change better describes its unique behavior of grabbing its tail and curling up into a ball when threatened by danger, a behavior only noted in this particular lizard. A few examples of an ouroboros will immediately identify the similarities between the myth and the lizard itself. The sungazer lizard was *Cordylus giganteus*, but is now known as *Smaug giganteus*. This name change is a bit more whimsical, as Smaug is the dragon from the J.R.R. Tolkien book *The Hobbit*. Whoever made this suggestion certainly has a sense of humor. Included below are some visual examples of Smaug and the ouroboros to better understand the origins of just where these scholars and scientific dignitaries were trying to make their point.

For details on the new taxonomy for the family Cordylidae and a full phylogenetic tree, see Stanley et al. (2010).

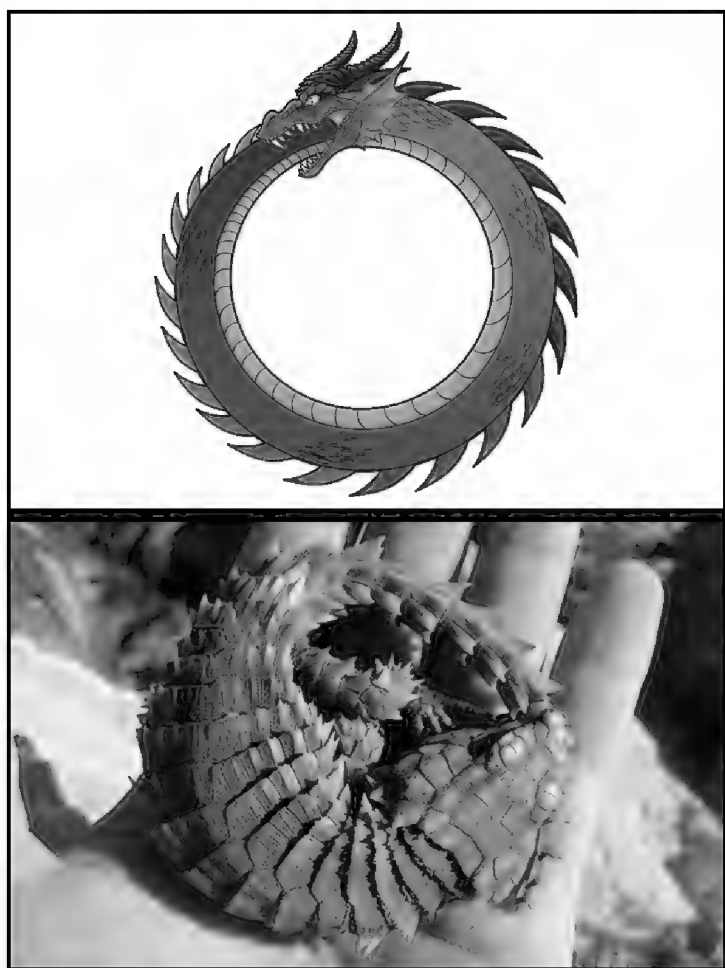
Literature Cited

Stanley, E. L., A. M. Bauer, T. R. Jackman, W. R. Branch and P. Le F. N. Mouton. 2010. Between a rock and a hard polytomy: Rapid radiation in the rupicolous girdled lizards (Squamata: Cordylidae). *Molecular Phylogenetics and Evolution* 58:53-70.

Two of the Name Changes in the Family Cordylidae

Cordylus cataphractus is now *Ouroborus cataphractus*

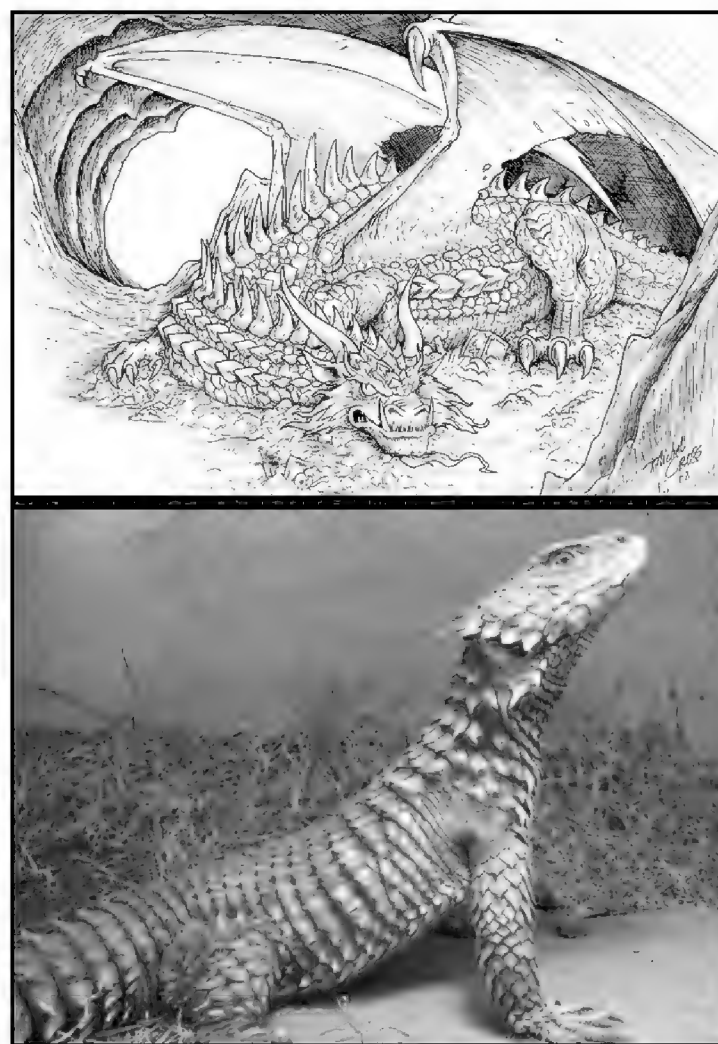
The ouroboros is an ancient symbol depicting a serpent or dragon with its own tail in its mouth. The name comes directly from the Greek οὐροβόρος, which means "devouring its tail." The ouroboros has been important in religious and mythological symbolism; it was used in ancient Egypt, Greece, India and Mexico. It was depicted in the 14th and 15th centuries of the Middle Ages, also 19th century Haiti. In Freemasonry, the ouroboros is displayed on numerous Masonic seals, frontispieces and other imagery, especially from the 18th century.



Above: the ouroboros. Below *Ouroborus cataphractus*.

Cordylus giganteus is now *Smaug giganteus*

Smaug, one of the last great dragons of Middle-earth, features in the novel *The Hobbit* by J.R.R. Tolkien. Smaug's scaly hide is invulnerable, but his softer underside is more vulnerable to attack. Tolkien created numerous pencil sketches and two pieces of more detailed artwork portraying Smaug. The latter were detailed ink and watercolor sketches.



Above: Smaug. Below *Smaug giganteus*.

Notes on Reproduction in Roundtail Horned Lizards, *Phrynosoma modestum* (Squamata: Phrynosomatidae) from New Mexico

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Abstract

A histological examination of gonadal material from roundtail horned lizards, *Phrynosoma modestum* from New Mexico was conducted. My finding of a 37 mm SVL male undergoing spermiogenesis is a new minimum size at maturity for *P. modestum* males. Mean clutch size for five females was 8.6 ± 4.0 SD, range = 5–13. Histological information is presented that multiple clutches are produced. The timing of the *P. modestum* ovarian cycle may be slightly earlier in New Mexico as opposed to southeastern Arizona and northeastern Sonora. My finding of one female with a clutch of five is a new minimum clutch size record for *P. modestum*.

Roundtail horned lizards, *Phrynosoma modestum* Girard, 1852, range from northern New Mexico to San Luis Potosí, Mexico, and from west-central Texas to southeastern Arizona (Stebbins, 2003). The most detailed study on the reproduction of *P. modestum* is by Howard (1974). Anecdotal information on the reproductive biology of *P. modestum* is in Lewis (1950), Stebbins (1954, 2003), Bundy et al. (1955), Minton (1959), Smith et al. (1963), Parker (1973), Pianka and Parker (1975), Vitt (1977), Behler and King (1979), Degenhardt et al. (1996), Sherbrooke (2000), Brennan and Holycross (2006), and Hodges (2009). The purpose of this note is to provide additional information on the reproductive cycle of *P. modestum* from a histological examination of gonadal material from museum specimens. Due to the difficulty in justifying collection of monthly lizard samples, utilization of museum collections for obtaining reproductive data has become increasingly important.

Methods

A sample of 77 *P. modestum* consisting of 27 adult males, (mean snout–vent, SVL = $50.7 \text{ mm} \pm 7.4$ SD, range = 37–62 mm); 37 adult females, (mean SVL = $55.8 \text{ mm} \pm 8.8$ SD, range = 36–70 mm), and 13 subadults, (mean SVL = $29.7 \text{ mm} \pm 3.6$ SD, range = 24–34 mm) was examined from the herpetology collections of the Natural History Museum of Los Angeles County (LACM), Los Angeles, California, USA and the Museum of Southwestern Biology (MSB), University of New Mexico, Albuquerque, New Mexico, USA. *Phrynosoma modestum* were collected 1930 to 2007. Specimens examined are listed by county in the appendix.

A small incision was made in the lower part of the abdomen and the left gonad was removed for histological examination. Gonads were embedded in paraffin and sections were cut at 5 μm , and stained with Harris hematoxylin followed by eosin counterstain (Presnell and Schreiber, 1997). Histology slides were deposited in LACM and MSB. Enlarged ovarian follicles (> 4 mm length) or oviductal eggs were counted. An unpaired *t*-test was used to test for differences between male and female SVLs using Instat 3 (Graphpad, San Diego, CA).

Results

Monthly stages in the testicular cycle are shown in Table 1. Three stages of the testicular cycle were present: (1) regressed, seminiferous tubules are at their smallest sizes and contain spermatogonia and interspersed Sertoli cells; (2) recrudescence, a proliferation of germ cells occurs in the form of spermatogonia, primary and secondary spermatocytes, for the next period of spermiogenesis; (3) spermiogenesis, lumina of the seminiferous tubules are lined by sperm or clusters of metamorphosing spermatids. The smallest reproductively active male (spermiogenesis) measured 37 mm SVL (LACM 101581) and was collected in May. This represents a new minimum size for reproductively active *P. modestum* males.

The mean body size (SVL) of my female sample was significantly larger than the mean (SVL) of my male sample (unpaired *t*-test, $t = 3.0$, $df = 64$, $P = 0.004$). Monthly stages in the ovarian cycle are in Table 2. Five stages were present: (1) quiescent, no yolk deposition in progress; (2) enlarged ovarian follicles (> 4 mm); (3) oviductal eggs; (4) corpus luteum present; (5) corpus luteum present with concomitant yolk deposition for a subsequent clutch. Females were reproductively active beginning in April (no March females were examined), continuing into July.

Table 1. Monthly stages in the testis cycle of 27 *Phrynosoma modestum* from New Mexico.

Month	<i>n</i>	Regressed	Recrudescence	Spermiogenesis
April	2	0	0	2
May	3	0	0	3
June	9	0	0	9
July	5	0	0	5
August	2	1	1	0
September	3	3	0	0
October	3	0	3	0

Table 2. Monthly stages in the ovarian cycle of 37 *Phrynosoma modestum* from New Mexico.

Month	<i>n</i>	Quiescent	Enlarged Follicles > 4 mm	Oviductal eggs	Corpus luteum	Corpus luteum and yolk deposition
April	4	0	1	1	1	1
May	4	3	0	1	0	0
June	2	1	0	0	1	0
July	8	4	4	0	0	0
August	9	9	0	0	0	0
September	8	8	0	0	0	0
October	2	2	0	0	0	0

Mean clutch size for five females is 8.6 ± 4.0 SD, range = 5–13. Five is a new minimum clutch size for *P. modestum* (LACM 101577, from July). Obtaining a reliable clutch size was problematical for (LACM 133251), from July as this lizard contained 4 ovarian follicles (2 on each side) that measured 4 mm and one on the right ovary that measured 2 mm. It was not possible to know if this 2 mm follicle would have enlarged and ovulated, which would have brought the clutch to five eggs or if this clutch would have consisted of four eggs. Due to this unresolvable issue, I did not include it in my calculation of a mean clutch size for *P. modestum*. This was also the smallest reproductively active female (SVL = 44 mm). The presence of corpora lutea from a previous clutch and concomitant yolk deposition for a subsequent clutch in (LACM 4363 from April) is histological evidence that multiple clutches may be produced in the same reproductive season.

Two of my subadult sample (LACM 19693) from August and (MSB 1328) from October both measured 24 mm SVL and were within the size of *P. modestum* neonates (21–25 mm) in Howard (1974).

Discussion

The two largest clutch sizes of 13 eggs, in my study, were

produced by *P. modestum* early in the reproductive season (April and May). Those from July ($n = 3$, mean = 5.7 ± 0.58 SD, range = 5–6) were smaller. Goldberg (1975) similarly reported a decrease in monthly mean clutch sizes in *Sceloporus vandenburgianus* (as *S. graciosus*) late in the reproductive season and postulated this might be due to a diversion of nutrients into fat storage for the coming winter. The timing of the *P. modestum* ovarian cycle may be slightly earlier in New Mexico as I reported oviductal eggs from April to July whereas Howard (1974) reported oviductal eggs present May to August from southeastern Arizona and northeastern Sonora.

In conclusion, I report a new minimum clutch size of five for *P. modestum*, histological evidence to support production of multiple clutches and a new minimum size of 37 mm SVL for male reproduction. Also, the timing of the *P. modestum* ovarian cycle may be slightly earlier in New Mexico as compared to southeastern Arizona and northeastern Sonora.

Acknowledgments

I thank C. Thacker (LACM) and H. Snell (MSB) for permission to examine *P. modestum* and J. Giermakowski (MSB) for facilitating the loan.

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Appendix

Phrynosoma modestum from New Mexico examined by county from the Natural History Museum of Los Angeles County (LACM), Los Angeles, California, and the Museum of Southwestern Biology (MSB), University of New Mexico, Albuquerque, New Mexico: **Bernalillo County** LACM 138429, MSB 194, 1305, 1323, 1328, 8603; **Dona Aña** LACM 4356, 4357, 4359-4365, 4367-4369, 4372, 101577, 113455-113463, 113465-113472, 133250-133254; **Grant** LACM 138430; **Hidalgo** MSB 8608, 51557, 51558; **Lincoln** LACM 4376, MSB 37152; **Luna** LACM 101578, 101579, **Otero** LACM 19763, 113474; **Quay** LACM 62554; **Sierra** LACM 4373-4375, 76703, 101580, 138431; **Socorro** LACM 19693, 19756-19758, 19760, 19761, 19762, 101581, 138432-138434, 138436, 138437, MSB 2007, 8607, 72548, 21008; **Valencia** MSB 72552.

Bull. Chicago Herp. Soc. 47(3):36-37, 2012

An Exploration of the Lizard Community at Homolavi State Park with Notes on Predator Signaling in Plateau Fence Lizards

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During the summer of 2001 and 2003 through 2005 we assessed the lizard community of Homolavi State Park (elevation 4900 ft) near Winslow, Arizona. The brief visit in 2001 revealed the presence of the stunning eastern collared lizard (*Crotaphytus collaris*) and the observation called for further investigation.

The park is situated in high cold desert near the southern rim of the Colorado plateau. The topography includes flat scrub fields punctuated by large boulder-concretion hills. Collared lizards were never seen in abundance and were usually stationed atop the boulder hills, with some occasionally venturing into nearby shrubs. We found the farthest afield collared lizard in a tall, dead shrub, about 50 feet from the boulder hills. That one

gave me a spirited chase when I attempted to photograph it. One collared lizard, observed by us in 2004, and doubtlessly male, possessed a nearly pure-white head with only very pale tan reticulation, a canary yellow nasal area, and a robin's-egg blue throat and ventrum. No other collared lizards in the area in 2003 or 2005 showed such striking coloration. Most other males had pale gray to white heads masked by heavier yellow-brown mottling while ventral surfaces were more greenish blue. This observation shows some underlying genetic variability in this population of undetermined size.

Occurring with eastern collared lizards and probably functioning as prey items for them were common side-blotched lizards (*Uta stansburiana*). Because these lizards possess excel-

lent crypsis within the boulder hills, population estimates for this lizard were difficult but there must have been hundreds of them. Side-blotched lizards were never found outside of the boulder hills and one likely reason for that was the fairly common occurrence of long-nosed leopard lizards (*Gambelia wislizenii*) among the shrubs of the lowlands. These attractive lizards are proficient ambushers. In order to estimate leopard lizard population density on the uplands near the headquarters, Mary observed at a distance of 20 feet, while I struck shrubs with a heavy stick. Together we managed to reveal one lizard per five shrubs, or about a lizard every 8 m². While leopard lizards may not be very common here, one factor that may impinge upon population size and stability is that leopard lizards are most often hit by cars on the Park's entrance highway (park naturalist communication).

Rare sightings of other lizard species did occur on or near boulder hills some distance from the headquarters complex. The first in downslope talus on a boulder hill was a single greater short-horned lizard (*Phrynosoma hernandesi*) found quiescent in the early morning chill. The next rarity was a single pale and ghost-like desert spiny lizard (*Sceloporus magister*). This lizard remained stationary as I photographed it but then scampered beneath a nearby shrub. Due to their size, adult desert spiny lizards probably feel safe from leopard lizard attack.

At the Park Service headquarters a small population of plateau fence lizards (*Sceloporus tristichus*) occupied a gravel area near landscaped areas and also near a faucet used for watering landscape plants. In early June 2003 the park naturalist took us for a headquarters "grounds" tour and just outside the sta-

tion's back door, a lone plateau fence lizard was basking. While caught between us and the station's stone wall, this lizard looked at our legs, stood erect, slightly raised its right foreleg (the one closest to us), and arched its back. The station naturalist commented on how odd it was that the lizard was showing cooling behavior so early in the morning. I read its behavior as predator signaling as according to Dial (1986) and Leal (1999).

To further test this interpretation of lizard behavior we walked tangentially by an open area behind the headquarters where dozens of these lizards bask and documented lizard reactions to our approach in a methodology similar to that described in Dial (1986). Immediately on walking toward lizards, each made eye-contact. When we approached to within two meters, lizards stood up with distinctly arched backs, occasionally lifting whichever foreleg was visible to us, and several lizards raised their tails to an angle of elevation of 10–25 degrees. If approach continued, the lizards ran in an arc away from us until they were beyond a three-meter radius. We observed back arching and to a variable degree the other associated behaviors on every approach within three to four meters. Lizards never hid behind shrubs or area rocks unless we continued the pursuit.

In several ways this behavior is similar to the predator signaling response reported for other iguanid lizards such as the greater earless lizard (*Cophosaurus texanus*), reported by Dial (1986) and for the Bonaire whiptail lizard (*Cnemidophorus murinus*) reported by Cooper et. al. (2004) and may derive from defensive and aggressive behaviors described for this species and congenics by Carpenter (1962) and Vinegar (1975).

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What You Missed at the February Meeting

John Archer
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I don't want to have Mike Pingleton speak at any more of our meetings. No, let me correct that. I don't want to have to write any more about Mike speaking at our meetings, or maybe I just don't want to write any more about Mike. I wrote about his July 2010 talk (Bull. Chicago Herp. Soc. 45(8): 128-131, 2010) and I heaped him with well-deserved praise, so what new will I say about him now? He's an author, poet and field-herper, and those are just some of his avocations. His photography is exceptional and his narration is compelling. His multitude of friends attests to his personality and he is always easy to be around. He approaches life with a grace and ease that only makes me jealous, and certainly belies his list of accomplishments that reflect his over-achieving life style. It would seem that I could easily hate Mike just because of how much he's accomplished and how worthless that makes me feel, but I can't because he is just too nice a guy. He's always mellow, unassuming, and a pleasure to hang with. No wonder he's invited to join so many herp trips. If he were just a little better, people would be paying him to join them.

So visit Mike's blog (pingleton.com). Explore his writing and photography. You will be impressed. Last visit Mike didn't want to do the standard travelog but this meeting he talked of his trip to Mexico and showed us that he can deliver a travelog with the best. With wit and aplomb Mike took us on an eight-day trip, showing not only great photography, but immersing us in the trip with intriguing asides and glimpses of local culture. He titled his talk "The Treasure of Sierra Madre."

Mike led off with how his first trip to Mexico started with an invitation from a field herping buddy, a flight to Tucson where

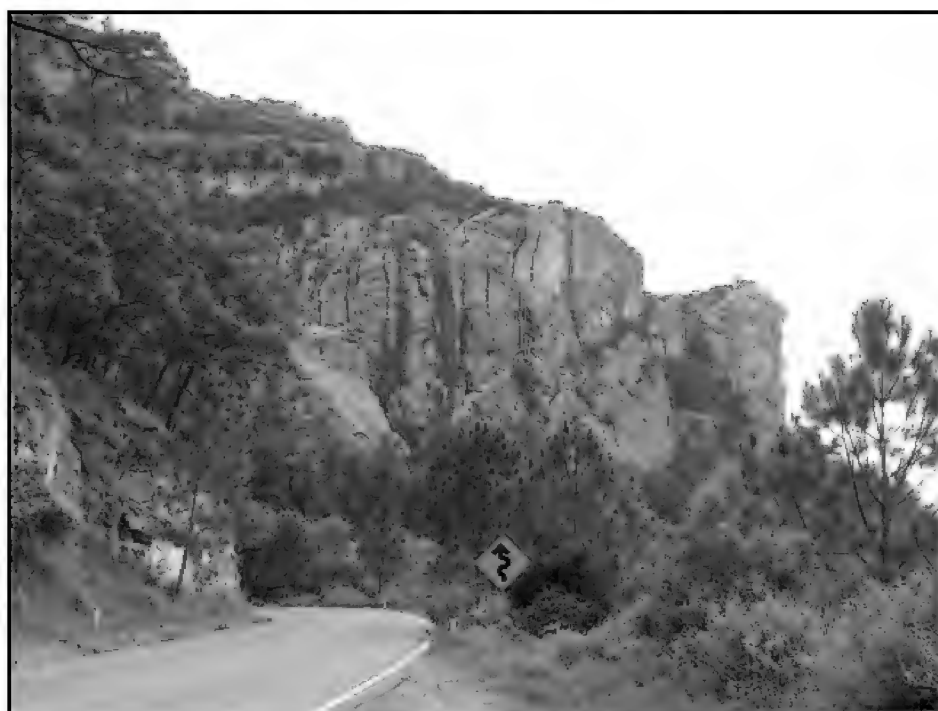


Mike Pingleton. Photograph by Dick Buchholz.

he joined six others, the rental of three cars and the long eight-hour drive to the first stop at Yécora to look for montane rattlesnakes. Yécora is not the most picturesque of Mexican towns and the King Hotel was not the most welcoming of inns, but for Mike, who is use to camping on his field trips, it was relatively luxurious. I guess his photo didn't do it justice. Road cruising that night yielded a Chihuahuan earth snake (*Geophis dugesii aquilonaris*), a pretty little white-banded black snake that's an uncommon find in Sonora. A photo of a Pemex gas station indicated the breakfast place the next morning. Mike describes a true herper's breakfast as bad gas station food and bad gas station coffee. The three cars set off into the mountains where the success of that foray was displayed as photos of not one but two Chihuahuan ridge-nosed rattlesnakes (*Crotalus willardi silus*) under the same rock. A ju-

venile black-necked garter snake (*Thamnophis cyrtopsis cyrtopsis*) and juvenile Mexican lyre snake (*Trimorphodon tau tau*) were followed by a Sonoran night snake (*Hypsiglena chlorophaea chlorophaea*). A Sonoran mud turtle (*Kinosternon sonoriense*) and a little narrow-mouthed toad (*Gastrophryne olivacea mazatlanensis*) added some variety to the snakes. More exploration yielded red-spotted toads (*Anaxyrus punctatus*) and a Madrean treefrog (*Hyla eximia*); the latter contributed to Mike's passion for photographing calling frogs.

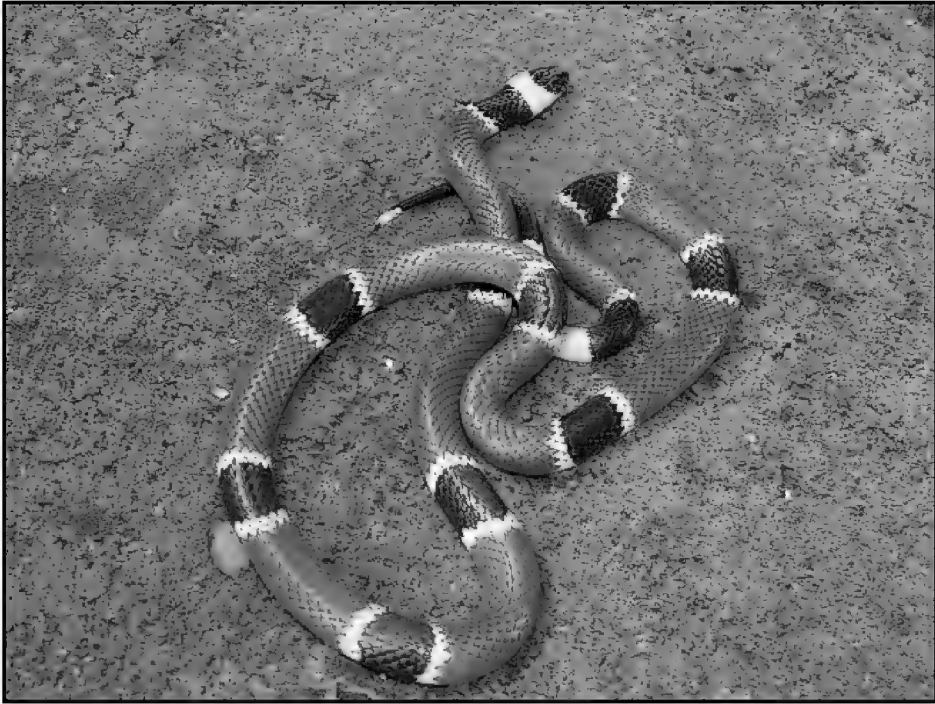
Mike adds bits of interesting facts to his talks. For instance, the skin folds on the heads of narrow-mouthed toads cover their eyes if the ants they try to eat get a bit too aggressive, and most of the time the dorsal scales of Mexican black-tailed rattlesnakes (*Crotalus molossus nigrescens*) are unicolored, giving them their characteristic mosaic patterns, and on roads toads



The rugged but gorgeous terrain of Mexico's Sierra Madre.



In situ photo of the first Chihuahuan ridgenose rattlesnake (*Crotalus willardi silus*) the party found.



Found in the town of Alamos, a birder's paradise in winter, but a herper's paradise in August. Clear-banded coral snake (*Micrurus distans distans*).



Rancho Acosta: "hot breakfast, swimming pools and boa constrictors." And five lifers before they reached their rooms!



Probably not as happy as he looks. Mexican monkey frog (*Pachymedusa dacnicolor*).



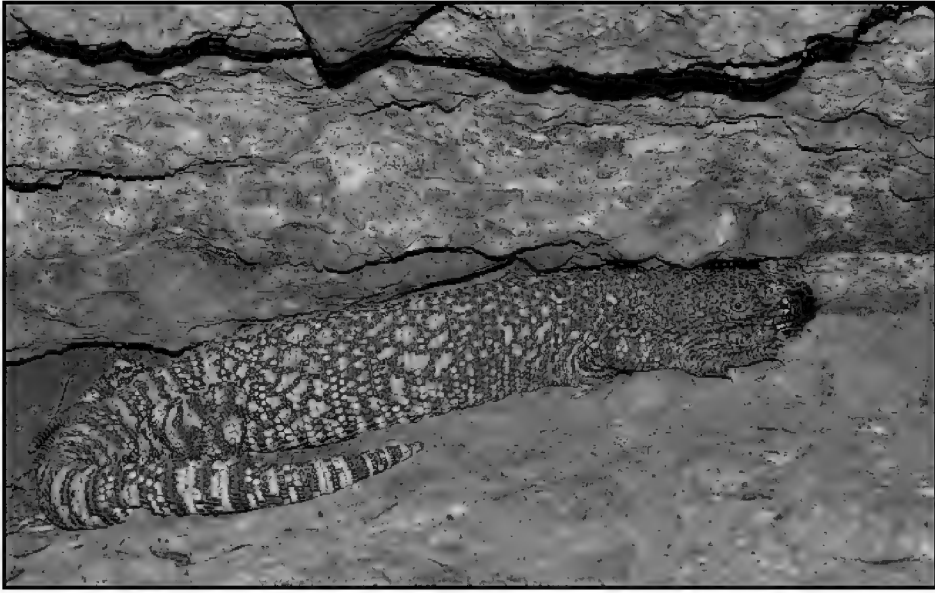
If you were a lizard you wouldn't be laughing. Brown vine snake (*Oxybelis aeneus*).



One of the high points of the trip for Mike. Spotted box turtle (*Terrapene nelsoni nelsoni*).



Mexican west coast indigo snake, or cribo (*Drymarchon melanurus rubidus*).



Apparently the lizards in Mexico just lie around waiting to be photographed. Rio Fuerte beaded lizard (*Heloderma horridum exasperatum*).

usually sit up while frogs lie flat. We were treated to pictures of green-soaked landscapes dotted with rocky outcrops, ominous photos of a hanging effigy in the middle of nowhere, and an example of the shrines to the Virgin Mary that dot the Mexican countryside. As the group headed toward the final destination of the trip, Mike spotted a turtle crossing the road, but not just any turtle. Joining the many lifers that Mike had already garnered, we relished great shots of the spotted box turtle (*Terrapene nelsoni nelsoni*), an uncommon and little-studied turtle that was found in unlikely habitat.

Mike admitted that he knew little of traveling in Mexico and, like many of us, he was concerned by the reports of extreme violence in that country. He said that the group was stopped by the national police, local police, and army numerous times, but the interactions were always professional and often very friendly, though a photo of a checkpoint surrounded by machine gun revetments reinforced the seriousness of the stops. He stressed that typical interactions with the local populace were very friendly and they felt welcomed nearly everywhere they went.

They arrived at Alamos late at night and drove around the town trying to find the hotel. Finally finding it, they hurried to deposit their bags and return to road cruising, but managed to get distracted simply walking to the rooms. Mike showed photos of a marbled toad (*Ollotis marmorea*), Sinaloa toad (*Ollotis mazatlanensis*), Mexican treefrog (*Smilisca baudinii*), yellow-bellied leaf-toed gecko (*Phyllodactylus homolepidurus*), and Mediterranean gecko (*Hemidactylus turcicus*) all photographed before they had reached their rooms and all lifers for Mike. He showed us a beautiful clear-banded coral snake (*Micrurus distans distans*) spotted as they pulled out of the parking lot to begin their road cruise. A DOR *Boa constrictor imperator* and a colorful but unfortunately DOR Sinaloan milksnake (*Lampropeltis triangulum sinaloae*) followed, but a truly exceptional and very alive Mexican longnose snake (*Rhinocheilus lecontei antonii*) allowed me to recover from the incipient depression that road kills tend to cause.

The next morning was a revelation for Mike. Having arrived at night when it was very dark his first good look showed a gorgeous hotel with a terrific view. Even the pool had a view. Wait! A pool? A picture of the group eating a large breakfast prepared by the two women that were hired just to care for this small group showed the consternation on Mike's face as he tried

to assimilate "a hot breakfast, swimming pools and boa constrictors. . . ." The juvenile boa would appear later at the hotel, but for now Mike thought he was in heaven for twenty dollars a day.

More animals graced the screen, including some spectacular moths that interested Mike, but even though it didn't seem necessary to leave the hotel, they decided to extend their herping to other locations, one being good habitat for beaded lizards. They had only just arrived when Mike walked up on a large Rio Fuerte beaded lizard (*Heloderma horridum exasperatum*). These Mexican herps seemed to be almost too easy to find! We got to see several photos of that find. As they were road cruising Mike spotted a frog crossing the road with a telltale gait that he recognized immediately as a species he had once kept. I've always enjoyed looking at monkey frogs. This one was the Mexican monkey frog (*Pachymedusa dacnicolor*). Hiring a guide, they were led to a biopreserve where the guide was involved in a radio-tracking study of desert tortoises (*Gopherus agassizii*). Driving as far as they could in their rental Hyundais, they declined a ride in the ranch vehicle in the hopes of spotting more herps as they walked into the preserve. In the heat, they came to regret that choice, but the walk in provided the first live boa constrictor and several photos of a brown vine snake (*Oxybelis aeneus*). Photos of what Mike thought to be highly unlikely desert tortoise habitat showed very dense and rocky forest, quickly followed by pictures of several of the tortoises spotted. On the way out they spotted another beaded lizard and a tortoise that seemed eager to allow Mike to take some great shots. They allowed themselves to be driven to their cars.

Back at the hotel Mike had pictures of him rescuing large quantities of toads that had fallen into an unfilled pool using a collapsible fish net he always carries. We were treated to photos of an unusual reduced-melanin black-necked garter snake, an amusing head-on shot of a brown vine snake, and another of the many highlights, a Mexican west coast indigo snake (*Drymarchon melanurus rubidus*). And, of course, gorgeously scenic habitat shots. He ended with a sunset shot of a distant mountain framed by organ pipe cactus.

As always, you're cheated if you have to rely upon my articles to convey our presentations. You missed the subtle blend of amateur investigator and professional presenter that Mike brings. He prepares his talks well enough that they flow smoothly and unforced. Scientific names usually roll off his tongue without the need to check his notes. Humor is frequently inserted and he's not afraid to mock himself. I can't convey his gesticulations as he describes hand cranked car windows and monkey frogs crossing the road nor his portrayal of his use of underwear as a sweatband (really, you had to be there). However, I think one incident reveals how Mike approaches his talks. During his presentation he was drolly chided once for not using meters instead of feet because he was in Mexico. Another wag in the audience quickly responded that we weren't in Mexico. Over the laughter, Mike quietly said, "That means I'm not doing my job." You were wrong, Mike. We were in Mexico, or as close as you could bring us. I'm sure that the next opportunity we have the pleasure of having Mike speak to us that I will go through more agony trying to think of new accolades that I can award him without repeating myself. I look forward to it.

Herpetology 2012

In this column the editorial staff presents short abstracts of herpetological articles we have found of interest. This is not an attempt to summarize all of the research papers being published; it is an attempt to increase the reader's awareness of what herpetologists have been doing and publishing. The editor assumes full responsibility for any errors or misleading statements.

NEW GENUS FOR MEXICAN MONTANE PITVIPERS

R. C. Jadin et al. [2011, Zoological Journal of the Linnean Society 163:943–958] report that as most recently recognized, the name *Cerrophidion barbouri* (Dunn, 1919) refers to a highland species of pitviper endemic to Guerrero, Mexico, of which *Agkistrodon browni* Shreve, 1938, is considered a junior synonym. This species is rarely collected and prior to recent decades it was known from only a few specimens. Careful re-examination of nearly all known specimens of *C. barbouri* and the type series of *A. browni* revealed that both names represent valid species and the authors therefore resurrect *A. browni*. Both species are extremely variable with respect to cephalic scalation and color pattern, which has previously confounded efforts to identify them. The authors provide phylogenetic analyses using both Bayesian and maximum parsimony criteria of New World pitvipers to investigate the phylogenetic position of *A. browni* and *C. barbouri*. The resulting phylogenetic tree strongly supports a clade consisting of *A. browni*, *C. barbouri* and *Ophryacus melanurus*, which has a distant sister relationship to *Ophryacus undulatus*. Based on the deep phylogenetic divergences among these species and distinctive morphology the authors recommend that a new genus, *Mixcoatlus*, be recognized for *A. browni*, *C. barbouri* and *O. melanurus*. The generic name is derived from the Náhuatl word *Mixcoatl*, meaning “cloud serpent,” a god of the Aztecs and several Mesoamerican civilizations. Finally, the authors revise the genera *Cerrophidion* and *Ophryacus* in accordance with the new classification.

FARMING OF BUTTERFLY LIZARDS IN VIETNAM

T. Hartmann et al. [2011, The Herpetological Bulletin 117: 15–18] note that trade in butterfly lizards (genus *Leiolepis*) as food items has been reported from Thailand and from Vietnam, but that the farming of lizards for food has only previously been reported from Central and South America. In spring 2009 one of the authors conducted an excursion along coastal dune habitats of Binh Thuan Province east of Ho Chi Minh City, Vietnam. Several spotted butterfly lizards (*Leiolepis guttata*) were observed in the wild, but also many were seen in enclosures in small coastal villages where they are farmed. The roofless enclosures measure up to half a hectare and are surrounded by a fence made out of corrugated metal sheets that are dug deeply or placed on top of a solid brick base. The lizards were fed on a diet of pumpkin slices and green vegetables. When for sale the animals are caught in rat traps and sold alive to local restaurants or to middlemen who sell them at local markets all over the area. The authors could not be certain if these lizards were bred at the farms or if they were wild caught animals that were fattened at the farms. The biggest farm animal seen had an impressive length of 73 cm. The biggest butterfly lizard previously documented had a total length of 55.3 cm.

AGE/SIZE DISTRIBUTION OF PYXIE FROGS

C. A. Yetman et al. [2012, The Herpetological Journal 22(1): 23–32] report that nothing is known about the age of wild giant bullfrogs (*Pyxicephalus adspersus*); yet this information has important conservation implications for this regionally threatened species. The authors quantified and compared the age, body size and body condition of adult male and female *P. adspersus* caught during spawning events at peri-urban breeding sites in Diepsloot and at Glen Austin and Bullfrog pans in Gauteng Province, South Africa. Age was estimated from lines of arrested growth (LAG) counted in cross-sections of animal phalanges. Males and females from all three sites possessed 6 ± 2 (max. 16) and 4 ± 1 (max. 11) LAG, respectively, suggesting shorter female longevity. Individuals with <3 LAG were not encountered at the breeding sites, implying that newly metamorphosed *P. adspersus* require at least three years to reach sexual maturity. There was no significant difference in the LAG counts of same-sex animals between the three sites. However, mean male snout–vent length, mass, and body condition was greatest at Glen Austin Pan, and lowest at Bullfrog Pan. The latter is possibly explained by chemical contamination of Bullfrog Pan from an adjacent disused landfill. At Glen Austin Pan males and females sampled in 2004–06 for this study were significantly shorter than those sampled at the same site in 1992–93 for a different study. Results suggest that male *P. adspersus* may live for 20 years or more in the wild, but at some peri-urban breeding sites adult life expectancy is declining. Juvenile *P. adspersus* are most threatened by terrestrial habitat transformation because they take ≥ 3 years to mature, during which period they may move great distances from their natal site. Differences in the size and condition of *P. adspersus* between the study sites suggests that the species requires site-specific management in addition to conservation at larger spatial scales.

NEW TREEFROG FROM ECUADOR

K.-H. Jungfer [2011, The Herpetological Journal 21(4):247–253] describes *Osteocephalus duellmani*, a new species of treefrog from the Ecuadorian part of the Cordillera del Cóndor, an isolated sub-Andean mountain range along the Ecuadorian-Peruvian border. Apparently an endemic to these mountains, it is one of the few species in the genus reaching an altitude of almost 2000 m. It is distinguished from other species in the *O. buckleyi* complex in the lack of spinous dorsal tuberculation, a relatively small tympanum, uniformly colored posterior surfaces of the thighs, lack of a row of tubercles on the lower jaw, and smooth fringes on the inner side of finger III and outer edge of finger IV. The specific name is a patronym for William E. Duellman on the occasion of his 80th birthday for his outstanding achievements in Neotropical herpetology.

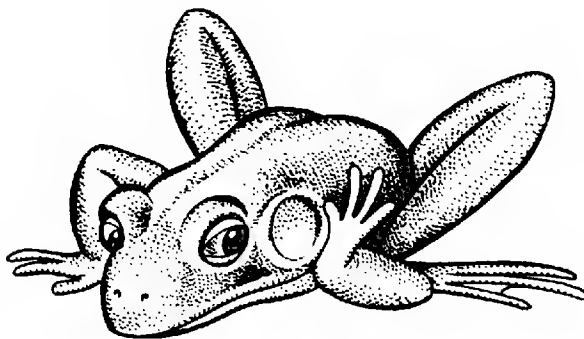
The Tympanum

Requiem for a Lightweight

There was almost nothing that made him unique. He wasn't the prettiest specimen. Far from it, he was ugly compared to others of his kind. In spite of that, he was labeled cute often enough to make me a little envious. He was voracious, but they all are. He was on the larger side for his kind, though nowhere near a record breaker. Apparently fearless, I don't remember him ever backing down from any threat. Once I found the cat on the outside of the cage looking in and him on the inside staring the cat right in the eye. I wondered which animal wished harder for the glass to disappear. He knew he could take that cat if he just had the chance. He'd come to the front of the cage anytime anyone walked by, always ready to eat, but I think sometimes just to look. He would eagerly snatch food from a hand, often with such speed that it had the presenter screaming and leaping back. He died last week.

I knew that death was close. I had stopped taking him to shows a long while back. In spite of eating well he lost weight. He had trouble lifting one leg. He moved slower. But he always responded when I opened his cage. Maybe I should have euthanized him, but who knows what a tiger salamander is feeling?

Check the records for the average life span of a tiger salamander and you'll find a range from 10 to 25 years. He was an adult when Ron Humbert presented him to me, and I'd had him for 12 years. I forget where Ron got him. The tiger was replacing salamander larvae that Ron had given me. My kids were young and I wanted them to observe that marvel of amphibian life, metamorphosis. I could have sworn that the cats could not reach the top of that dresser, but I was wrong and the larvae paid



the price. Ron understood that things don't always go right when you keep animals. We acquired the tiger salamander as a consolation prize. The salamander was not the only animal I would obtain through Ron's generosity, but he was one of the earliest.

My collection of animals grew, and I started keeping other salamanders and frogs. But the tiger remained the king. He would always snatch that wax worm from the fingers of the slightly trepid child, giving all of the observers a start and creating a cacophony of cries to be the next wax worm dispenser. Teenage girls would inevitably mention how cute he was, while his only thought behind that built-in smile was probably, "Feed me." As he sat in his display cage he inspired hundreds of questions about salamanders and all amphibians. My son could hold a group enthralled as they crowded around the little two-and-a-half-gallon display cage and he waxed eloquent about his favorite salamander. Every once in awhile a particularly avid child, at the end of show and always with the permission of their parent, would be able to wet their hands and carefully lift the critter into his traveling container. That amphibians are slimy was impressed upon them forever.

I try not to anthropomorphize my animals. I rather agree that when we force our feelings and thoughts into the mind of an animal we cheapen the variety and meaning of the responses an animal can have that have no correlation to human cognition. But it's hard to avoid feeling a kinship to animals that we've interacted with so much. The tiger salamander didn't want to be put on display, but he handled it like a pro, and in doing so he educated many, many people. I didn't shed a tear when I found him lying immobile in his cage. Really, I didn't. That happened as I wrote this. **John Archer, j-archer@sbcglobal.net**

Unofficial Minutes of the CHS Board Meeting, February 17, 2012

The meeting was called to order at 7:44 P.M. at the Schaumburg Public Library. Board member Jason Hood was absent.

Officers' Reports

Recording Secretary: The minutes of the January 13 board meeting were read, corrected, and accepted.

Treasurer: The January financial report was presented, discussed and accepted.

Membership Secretary: Mike Dloogatch hopes that the recent increase in memberships continues. He read the list of newly expired memberships.

Vice-president: Cindy has confirmed speakers through to the July meeting and for October.. She is working on filling the remaining months.

Publications Secretary: Aaron LaForge has an event calendar up on the web site, and will update the speaker info.

Sergeant-at-arms: Jim Foster reported that the attendance at the January meeting was 45.

Committee Reports

Shows:

- Notebaert, first full weekend of each month. Josh Chernoff is coordinator.
- Chicago Kids Expo, March 3,4. Dick Buchholz will organize.
- Project Exploration Dino Dinner, March 9. Jenny Vollman will coordinate.
- Reptile Rampage, Lake Forest, March 11. Rob Carmichael runs this event.
- Family Pet Expo, Arlington Racetrack, March 16–18. Dick Buchholz and Jenny Vollman.
- NARBC Tinley Park, March 17 & 18. Lawrence Huddleston will manage our table.

Update: Great Lakes Pet Expo had an incredible year – attendance: 10,500 people!!

Reptilefest: Petsmart is on board as a sponsor, advertising is proceeding well.

Grants: The committee met in January, and awarded 12 grants.

Old Business

Extra General Meeting: A special weekend meeting of the CHS will be held on Saturday, June 16, 5:00 P.M., at the Tyner Center, 2400 Compass Drive, in Glenview. The speaker will be Chip Cochran, giving a presentation on his rattlesnake research. Cold food will be allowed, and hiking trails are available. More details to follow.

New Business

March and April board meetings: Because of the show schedule in March, the date of the board meeting has been changed to March 23, The meeting will be held at Wildlife Discovery Center. The normal date of the April board meeting would

conflict with ReptileFest. Because of this there will be no board meeting held in April.

Senate Bill 3264: There was much discussion regarding this proposed change to the Illinois Dangerous Animals Act and its possible consequences, as well as what our response to it should be, both as a Society and individually.

Website promo: The ad that has occasionally run in the *Bulletin* promoting the CHS website needs to be updated. Mike will send a PDF of the ad to anyone interested in working on it.

Speaker gifts: Jessica Tschampa has made key chains to be given to our upcoming speakers.

Honorary membership: Linda moved to make Dotty Humbert an honorary CHS member in recognition of all the Humbert family did for the CHS over the years. Lawrence seconded, and after discussion, the motion passed unanimously.

Round Table

Deb has a new dog, Cisco VonSchnitzel.

Andy received the renewal application from our insurance agent, and we have been advised that any vendors at ReptileFest should have their own insurance, and we should be named as an additional insured on their policies.

Jessica will have a table at NARBC.

J.T. Turingan just launched a new phone app, and would like to link to the CHS website.

The meeting was adjourned at 9:24 P.M.

Respectfully submitted by recording secretary Jenny Vollman



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UPCOMING MEETINGS

The next meeting of the Chicago Herpetological Society will be held at 7:30 P.M., Wednesday, March 28, at the Peggy Notebaert Nature Museum, Cannon Drive and Fullerton Parkway, in Chicago. The speaker will be **Marisa Tellez**, a Ph.D. candidate in biology at UCLA. Marisa's topic will be "The Good, the Bad, and the Ugly—Investigating the Interaction between the American Alligator and Its Parasites." Marisa's research is the first in-depth study to investigate the relationships between a crocodilian and its parasites.

Speaking at the April 25 meeting will be **Doug Hotle**, curator of herpetology at the Rio Grande Zoo in Albuquerque, New Mexico. Doug will speak about the Albuquerque BioPark's Native Species Recovery Program.

The regular monthly meetings of the Chicago Herpetological Society take place at Chicago's newest museum—the **Peggy Notebaert Nature Museum**. This beautiful building is at Fullerton Parkway and Cannon Drive, directly across Fullerton from the Lincoln Park Zoo. Meetings are held the last Wednesday of each month, from 7:30 P.M. through 9:30 P.M. Parking is free on Cannon Drive. A plethora of CTA buses stop nearby.

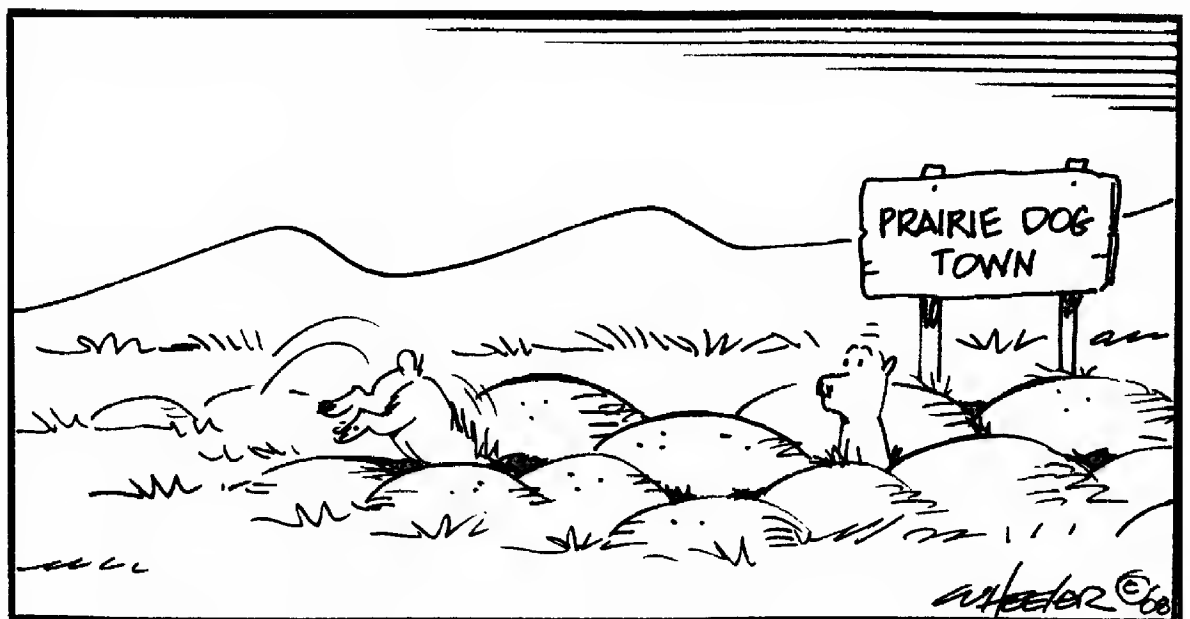
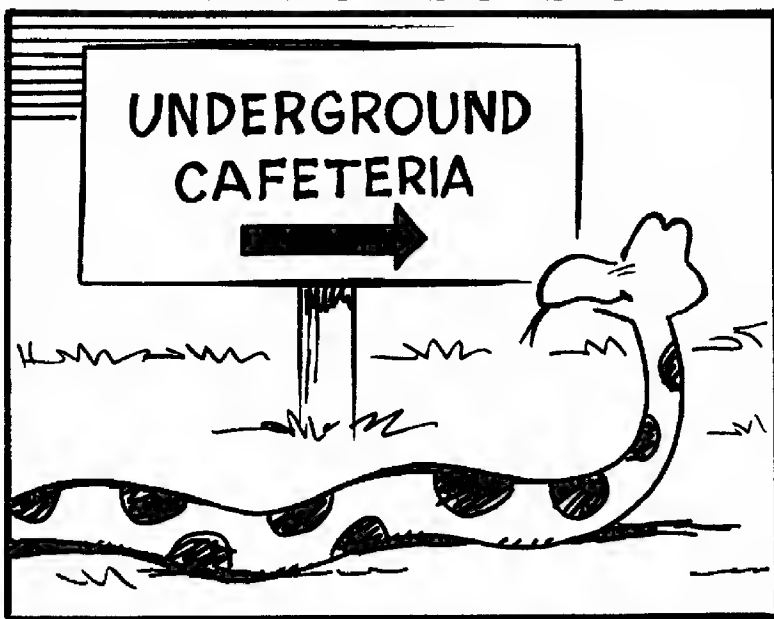
Board of Directors Meeting

Are you interested in how the decisions are made that determine how the Chicago Herpetological Society runs? And would you like to have input into those decisions? If so, mark your calendar for the next board meeting, to be held at 7:30 P.M., May 18, in the adult meeting room on the second floor of the Schaumburg Township District Library, 130 S. Roselle Road, Schaumburg. (Note: no April board meeting due to ReptileFest.)

The Chicago Turtle Club

The monthly meetings of the Chicago Turtle Club are informal; questions, children and animals are welcome. Meetings normally take place at the North Park Village Nature Center, 5801 N. Pulaski, in Chicago. Parking is free. For more info visit the group's Facebook page.

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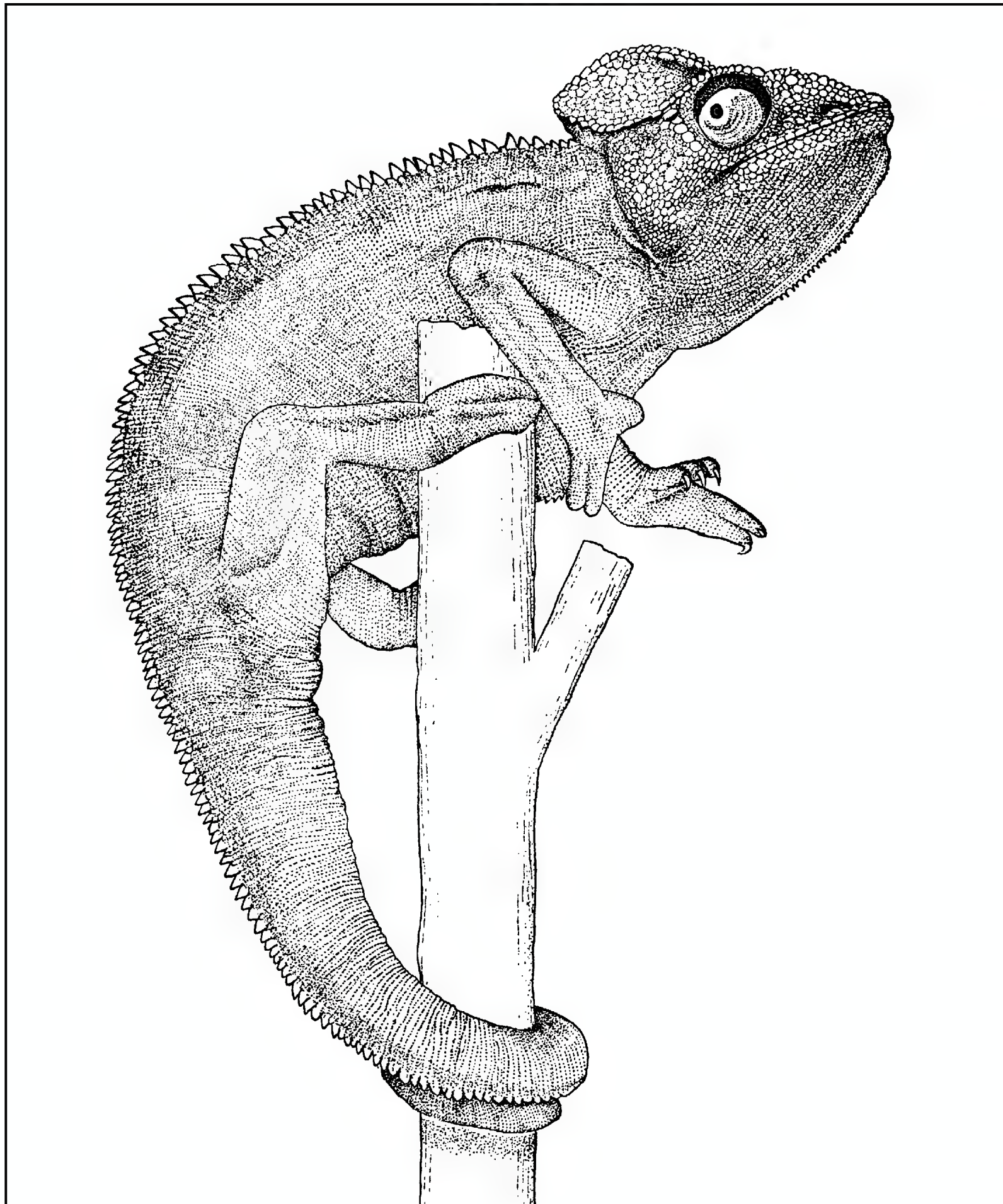
BULLETIN

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Chicago Herpetological Society



Volume 47, Number 4
April 2012



BULLETIN OF THE CHICAGO HERPETOLOGICAL SOCIETY

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A Review of: Dorcas et al. 2012. <i>Severe Mammal Declines Coincide with Proliferation of Invasive Burmese Pythons in Everglades National Park</i>	David G. Barker and Tracy M. Barker	45
What You Missed at the March Meeting	John Archer	51
The Tympanum: Of Pythons and Pit Bulls: Pushing Back against Media Bias	Cindy Steinle	53
Herpetology 2012		54
HERP-ACROSTIC #21	Mike Dloogatch	55
Unofficial Minutes of the CHS Board Meeting, March 23, 2012		56
Advertisements		56

Cover: Male Oustalet's chameleon, *Furcifer oustaleti*. Drawing from "Faune de Madagascar XXXIII — Reptiles. Sauriens Chamaeleonidae, le genre *Chamaeleo*" by E.-R. Brygoo, 1971.

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A Review of: Dorcas et al. 2012. *Severe Mammal Declines Coincide with Proliferation of Invasive Burmese Pythons in Everglades National Park*. Proceedings of the National Academy of Science. Online at: doi/10.1073./prias/1115226109

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We have lived in a rural setting in the Hill Country of Texas for over 20 years. Until recently we had not seen a skunk, live or DOR, on the five miles of country road we drive to our house, but we have seen three in the past year. There are three species of skunks here and they have been here all along, we smell their essences wafting in on the wind from time to time. We had not seen a ringtail (*Bassariscus astutus*) on the road in 15 years, but we've seen two this year. We mention this to illustrate the uncertainty and vagary of estimating mammal presence and population density on the basis of road driving.

The paper under review is about road driving. It is a weak and deceptive paper. It is the latest contribution of the GCRAP researchers, and it is little more than fodder for the media who apparently starve for any further shred to feed the story that Burmese pythons in Florida may be worse than the asteroid that ended the Cretaceous.

This paper is multi-authored by Michael E. Dorcas, John D. Willson, Robert N. Reed, Ray W. (Skip) Snow, Michael R. Rochford, Melissa A. Miller, Walter E. Meshaka, Paul T. Andreadis, Frank J. Mazzotti, Christina M. Romagosa and Kristen M. Hart—all apparently in the belief that if enough GCRAP researchers sign on to a paper, then it must be true. These are many of the all-stars of the GCRAP camp. And for those readers who have not followed this story for the past few years, we explain that “GCRAP” is the acronym for the “Giant Constrictor Risk Assessment Partnership,” the name this merry band assigned to itself.

We note that this paper is not sponsored or funded by the National Academy of Science, as has been erroneously reported in several media accounts, but rather is published in the Proceedings of the National Academy of Science—and according to Mazzotti (2012) that is a big difference. As is protocol for this journal, the editor is cited below the authors—this paper was edited by Peter M. Vitousek, an environmentalist from Stanford working with soils and nutrient recycling. Looking through his extensive and impressive resume, we see no evidence that he has any interest, experience or expertise with vertebrate zoology, predator/prey interactions, herpetology, mammal surveys, or the Everglades region—those being the general topics of this paper.

Synopsis

The title of this paper could be “Severe mammal declines coincide with [fill in the blank].” With confidence equal to any correlation with pythons proven by this paper, one could write into that blank “drought in the ENP.” Or “increase in atmospheric CO₂.” Or “increase in solar flares and sunspots.” Or “increased traffic and tourism in ENP.” Or “increase in feral hogs in ENP.” Or “increase in invasive fire ant presence in ENP.” Even “collapse of the housing market” is just as true as “proliferation of pythons.”

The paper begins with the apparently obligatory paragraph meant to describe the monumental importance of Invasion Biology itself. The various references include, of course, the estimation of Pimentel et al. (2005) that invasive species cost the US billions of dollars; the following apocryphal statements are supported by papers that describe the environmental mayhem caused by cane toads, ants and cordgrass—but nothing pertaining to the Everglades National Park [ENP] or to snakes of any sort.

The last sentence in the first paragraph reads as follows: “Invasive predators can reduce or even extirpate native prey populations” (Gurevitch and Padilla, 2004). Of course, it seems obvious that any predator—invasive, alien, or native—can reduce prey populations. However, the article of Gurevitch and Padilla (2004) concerns extinction and not extirpation, and offers little support to the statement made by Dorcas et al. We were interested to note that Gurevitch and Padilla (2004) observe that of the 762 species globally documented to have become extinct as a result of human activities in the past few hundred years, fewer than 2% list alien species as a cause; of those, predatory invasive terrestrial vertebrates are an even smaller percentage of cause.

The first sentence of the second paragraph states: “Nonnative reptiles are increasingly recognized as problematic invaders.” and incorrectly cites Pough (1980) to support this statement—nowhere in that paper is such a statement made. The paragraph then goes on to make general statements about the dangers invasive snakes pose to ecosystems. Of course, all supporting references to those statements are publications concerning the brown treesnake in Guam, as it is the only truly invasive snake species. It is our observation that the comparisons made in nearly every GCRAP publication of Burmese pythons in the Everglades to brown treesnakes in Guam are invalid and pointless. One is an arboreal colubrid snake that invaded a small island with no native snakes, no natural predators, and a dense human population—the other is a terrestrial medium-to-large python that is established in an immense protected Florida refuge with many native snakes and many native predators. There is no correlation between the actions, effects and futures of the two snakes.

The first half of the third paragraph describes the history of Burmese pythons in south Florida in five sentences, three of which emphasize that these pythons really eat a lot of a wide variety of Florida animals. The second half of this paragraph is a description of the methods used and the purpose of this paper. The authors state their hypothesis on which this paper is based, writing: “Here, we present spatial and temporal data supporting the hypothesis that Burmese pythons have severely reduced populations of several species of formerly common mammals in ENP within 11 y of being recognized as an established invasive species.”

Basically, this paper is based on “systematic road surveys” as a means to sample the mammal population. In other words the authors drove back and forth at night on roads in and around the Everglades National Park and counted the mammals, live and dead, that they saw. Four separate surveys were created in this manner: in 1996–1997 a total of 6,599 km (4,100 mi) were driven on 51 nights in the ENP in areas where years later Burmese pythons were recorded; during 2003–2011 a total of 56,971 km (35,400 mi) were driven on 313 nights in the ENP in areas where Burmese python reports were most concentrated; during 2009–2011 a total of 4,794 km (2,978 mi) were driven on 26 nights in four locations that they believed that Burmese pythons had recently colonized. In two areas north of the Everglades ecosystem where Burmese are not found, during 2009–2011, 278 km (172 mi) were driven on one night in one of the areas and in the other area, on nine nights a total of 539 km (334 mi) were driven.

A problem we have with the data set is that according to Mazzotti (2012), the actual study was undertaken by GCRAP in 2009. The data for the years of 1996–97, and from 2003 into 2009 were compiled from other sources not specified in the paper. The one identified extraneous source of data is Holbrook and Chesnes (2011), itself a weak and poorly designed undergraduate research paper based on 18 nights of road-driving.

For comparison reasons, the total number of sightings of each species was divided by the number of kilometers driven in that survey (animals/km) and that figure then multiplied by 1/100 (animals/100 km) to give the number of animals seen in 100 km (62 mi) of driving. They refer to this as the “corrected sighting rate.” For example, the authors report sighting five opossums in 56,971 km, giving a corrected sighting rate [csr] of .0088, which they round up to .01.

Additionally, during 1993–1999, the park rangers in the ENP recorded all road-killed animals. They did not maintain records of the mileage associated with the DOR records, and, though not stated in this paper, we assume park rangers recorded all DOR animals throughout the year as encountered, day and night.

The observations of only a few mammal species are reported in this paper. There are generic categories of “rodent,” “fox,” and “rabbit” and then more specific categories of opossum, raccoon, coyote, bobcat, panther and deer.

The authors then did before-and-after comparisons between the data from the 1990s and the data for 2003–2011 compiled apparently from several different sources. “Before” of course refers to before Burmese pythons were realized as becoming established in south Florida in the 1990s, and “after” refers to this past 10 years when Burmese pythons were found in the ENP. They also made comparisons of the observations of mammals made in the “core python habitat” [that being the Main Park Road in ENP] and in the two “peripheral locations” and the two extralimital locations.

There is no analysis, no statistical evaluation of results, and no science in this paper. This paper is based solely on the observations made during road driving. The bulk of the paper comprises unfounded speculation on why Burmese pythons must have been responsible for the declines they report in rabbits,

opossums, raccoons, foxes, bobcats, and deer while observations of rodents, coyotes and panthers increased.

Comments on the decline of mammals

We refer to this paper as weak for the following reasons. First the authors fail to convincingly demonstrate that any significant mammal decline has occurred. Second, the authors completely fail to demonstrate that the presence of Burmese pythons has had any significant negative effect on the populations of mammals in south Florida.

The authors state: “However, our reliance on indirect estimates of mammal abundance in ENP is the result of a nearly complete absence of actual density or population size estimates based on rigorous and repeatable field methods.” In other words, they have no idea how many mammals existed in ENP before or after Burmese pythons. They have no idea of the distribution, habitat preferences/requirements, or population densities of mammals in ENP before and after Burmese pythons. They don’t have a clue about naturally occurring population cycles for any of these mammals in ENP.

When we state that the authors fail to convincingly demonstrate that any significant mammal decline has occurred, we are not talking about statistical significance. There probably is a statistically significant difference between the number of raccoons seen in 1996 (csr 2.79) and 2004 (csr 0.1). Rather we refer to the irrelevance of basing any such declarations on data for populations of mammals based on indirect estimates over a short time span. Mammal populations are not stable through time, they wax and wane. Most mammal populations cycle in size over a multi-year period of time that varies species to species. Additionally, populations of animals increase in response to favorable conditions such as food surpluses and mild weather, and decrease in response to drought, disease, inclement weather, and overpopulation.

Looking at the data created by park rangers from 1993 to 1999 compared to the data from 2003–2011, there appears to be a decline in the medium-sized mammal species. However, any comparison is invalid for the following reasons. The park ranger survey is based on multiple observers in multiple vehicles in operation day and night. No record was made of miles traveled, so no “corrected sighting rate” can be generated.

The 1996–97 road survey in this paper began at dusk and averaged 2 hours of driving. The surveys of 2003–2011 averaged 2.9 hours of driving at different intervals between dusk and dawn. Post-midnight mammal activity was unsampled in the 1996–97 survey, and post-midnight/pre-dawn mammals were mostly unsampled in the surveys of 2003–2011. DOR mammals killed after midnight likely are consumed at dawn by the black vultures, corvids, and raptors that exist in large numbers in ENP. These DOR animals would have been reported in the Park Ranger surveys of the 1990s, but invisible to the surveys of this study. We mention that it is our observation here in Texas that during hot weather, mammal activity is greatest in the pre-dawn hours, not at sunset.

In fact, only three of the mammal species show any dramatic variation from the 1996–97 survey to the 2003–11 survey, those

being opossums, raccoons, and deer. Of those three, deer are irrelevant to the hypothesis of the authors because deer numbers are dramatically reduced in all three recent survey areas—the core region, the peripheral regions, and the extralimital regions. To their credit, the authors do muse that “. . . the relatively low numbers of deer observed in recent surveys at peripheral and extralimital sites raises the possibility that factors other than pythons *may* have contributed to declines in deer populations” [italics ours]. We wonder why the authors then dismiss the possibility that factors other than pythons might also affect the other species.

It was misleading to have mentioned deer in this study when deer numbers were so low in every area. According to Fleming et al. (1994) “. . . Everglades deer herd contingent characteristics portray a population with a relative low abundance, low productivity, and smaller body size. . . .” In other words, even 20 years ago, deer were not plentiful in the ENP. Fleming et al. (1994) also noted that in wet periods deer were found in higher densities in restricted areas [such as the dry elevated roadways in and around ENP], but in dry periods the density of deer was reduced and deer spread into the larger areas of dry habitat; consider that the past 10 years have been the driest period in the history of ENP. Further, we question any realistic probability that pythons could have negatively affected deer numbers—there are not many pythons to begin with and only a very small portion of the python population is large enough to eat even small fawns.

Raccoons show the greatest decline of all mammals in the survey. There are several points to be emphasized. The authors note: “In the 1980s, raccoons were such nuisances in campgrounds and visitor-use areas that a control program was initiated in ENP.” So in other words, the park service elected to eradicate raccoons, but now they are wondering where they all went. Even measures taken to make all refuse areas and garbage cans raccoon-proof, dramatically reducing this previously plentiful food supply for raccoons, would reduce the numbers of raccoons. It is possible that the survey of 1996–1997 was at the exact time of the greatest population of raccoons in the history of the park, the population numbers artificially elevated by a surplus of human-provided food. Such a surplus also likely increased the numbers of opossums, as they too are inveterate camp raiders like raccoons.

It’s also worth mentioning that Snow et al. (2007) found raccoons to be a rare item in the diet of ENP pythons. Only two out of 54 prey items (3.7%) recovered from a sample of 56 pythons examined during 2003–2006 were raccoons. Opossums made up only 1.8% of the items. Rodents, all species (including squirrels), comprised 38.9% of the dietary items recovered from pythons in the sample.

Speed limits were lower in the 1990s in ENP than the current 55 mph limit for most of the Main Park Road from where most of the survey took place. It’s possible that medium-sized mammals, including raccoons, that lived near roadways had a higher survival rate than is now possible with faster traffic.

Raccoons are subject to a variety of diseases that will devastate local populations, including rabies, pseudorabies, leptospirosis, canine distemper, parvoviral enteritis, and toxoplasmosis.

The authors dismiss disease as a possible cause of the population declines seen in raccoons, opossums, foxes, rabbits, bobcats and deer, stating that there is no evidence of a disease that could have resulted in the widespread population declines in all taxa in this study. This seems to us to be extraordinarily naive. The authors go on to state: “Limited evidence of disease has been noted in the varied mammalian taxa that have declined in ENP during the time period we examined. . . .” So there wasn’t any one big disease, but apparently there were several little diseases. No information is provided to explain this mysterious statement, clarifying what diseases were reported in which of the taxa.

The authors do not consider the pollution of ENP as a possible factor in the decline of raccoons and the other mammal species. There is increasing concern about pollution in ENP by methylmercury. Methylmercury is a highly bioaccumulative form of mercury that has remained a chronic water quality problem and poses a neurotoxic threat for wildlife and humans in ENP (Axelrad et al., 2011.) Because the diet of raccoons and opossums include a high percentage of aquatic and semi-aquatic animals, both carry heavy, even toxic loads of mercury. The ongoing drought in ENP has concentrated water and perhaps has concentrated toxin loads in the vertebrates in ENP.

The flow of fresh water through the Everglades is steadily declining. The ENP is the driest it has been in recorded history. It is so dry that in 2010 the ENP was removed from the list of Ramsar Wetlands of International Importance. The dramatic reduction in water in the ENP has undoubtedly affected all of the mammal species in this study. The authors summarily gloss over any effect with the following statement: “. . . other than changes in water-management regimes, anthropogenic impacts in ENP that might result in mammal declines have not changed markedly during the last two decades.” So there is an ongoing “water-management” change that has significantly reduced flow and dropped water levels to such an extreme degree that it has received international attention, but the authors don’t even discuss the possibility that these eco-destructive conditions might have affected the mammal species.

We contend that the drought conditions in ENP have at least two effects on mammal populations. One is that the distribution of terrestrial mammals changes in response to conditions. For example, in the Everglades it is reported that in wet conditions, rodent population densities are high as the rodents are restricted to smaller areas; during dry periods, population density drops as animals disperse more widely (Smith and Vrieze, 1979). One obvious result of lower population densities is that individual animals are encountered at a lower rate in areas that previously had higher population densities, which would result in a reduction in the numbers of animals sighted in road surveys.

The second effect is that less water flow and decreased acreage of inundated land surface reduces the food base for terrestrial predators of fish and crustaceans such as raccoons and opossums. It also crowds aquatic predators such as alligators into the limited suitable water holes (Fujisaki et al., 2011). This, in turn, makes activities near water more hazardous for terrestrial animals that come to water to drink or forage.

The authors state: “. . . raccoons and opossums often forage

near the water's edge, a microhabitat frequented by ambushing pythons." We find it hard to believe that raccoons and opossums ever casually amble near the water's edge in an area with probably the largest alligator population in the country. Of course, pythons also have to be vigilant when near water in ENP, as pythons at all age and size classes are potential prey for alligators. The GCRAP camp never misses a chance to claim that pythons eat alligators. It has happened, but it is an incredibly rare event; however, alligators readily feed on pythons. In dry times when the alligators are crowded and hungry, it is dangerous for pythons to get too close to the water. [We digress here to mention that we can find only one report of an alligator being eaten by a python (Snow, 2007), that being the well-circulated photo of the dead headless python with the gator hanging out of a gash on the python; in that case, the bones of the skull of the ingested alligator were crushed, evidence that it was dead prior to being encountered by the python. We note that the recent report of Fujisaki et al. (2011) does not mention python predation on alligators.]

Dorcas et al. make the following unsupported statement: "These species [referring to the species in their survey] can serve as proxies for species of conservation concern that often are more difficult to monitor because of low densities, spotty distributions or secretive behavior." No, they can't! This is a ridiculous self-serving fiction that is created by the authors; undoubtedly it will serve as a reference in a future GCRAP paper.

The authors write: "Additionally we documented slight increases in sighting rates of rodents, coyotes, and Florida panthers within ENP. However, the overall numbers for these groups are low both before and after python proliferation, making firm conclusions regarding the status of their current populations difficult." In light of the hypothesis that the authors are trying to support, it seems impossible that under a regime of python predation so strong as to devastate the populations of middle-sized mammals that the population of the most common prey found in the diet of ENP pythons, rodents, would increase. It seems equally unlikely that the populations of two other apex predators, coyotes and panthers, would increase if pythons had consumed their prey base. The authors declare they are unwilling to make a firm conclusion about these animals because of the low numbers, yet they seem to be completely willing to blame pythons for rabbits, bobcats, and foxes, those being populations with similarly low numbers.

We note that two of the authors of this paper, Reed and Mazzotti, are co-authors of a recent paper on trapping Burmese pythons (Reed et al., 2011). In summary, that paper recounts the unsuccessful attempts to trap Burmese pythons in an area known as Frog Pond. The study took place in 2009, at the height of Burmese python populations in south Florida, and just before the two ensuing cold winters significantly reduced python numbers by nearly half. Frog Pond is an area on the eastern margin of ENP just north of the east end of the Main Park Road. Frog Pond was believed to be the area with the densest concentration of pythons. The authors report that 6053 trap-nights resulted in three python captures; 37 rodents also were trapped. After the project ended and the traps were removed, this 550 ha

(1360 acres) area was harrowed. This revealed a total of 11 Burmese pythons. Over the several days it took to harrow the entire area >200 rats were daily observed fleeing from the tractor and harrow. We note that in the discussion of this paper, Reed and others propose that the trapping experiment failed because there were not many pythons and there was an immense population of rodents that served as prey for the pythons present in the area.

Because of the failure of Dorcas et al. to even mention this paper, despite Reed and Mazzotti being authors of both reports, we propose that a lie of omission is committed. It simply cannot be ignored that one GCRAP paper states that their study failed because there were few pythons and too many prey animals, while another contends that the "apparent incredible density of pythons in ENP" is responsible for the near extirpation of prey animals in the entire region. By this act, the extraordinary bias of the GCRAP researchers and the government agencies they represent are well illustrated.

For the reasons we have stated, we feel that this paper in no way conclusively demonstrates that any significant decline has occurred that cannot be considered as the result of natural processes, diseases, normal population cycles, and the increasingly dry conditions in ENP. Only raccoons and opossums have shown any significant reduction of numbers, but there are particular circumstances for those two species that better explain any changes in population numbers.

Comments on the hypothesis of the authors

The essence of the hypothesis is that mammal populations in ENP have declined and pythons are the cause.

We question why the authors did not include Burmese pythons in these surveys? What was the corrected sighting rate of Burmese pythons in the road surveys and why are these figures not included in this paper?

In fact, Burmese pythons have never appeared to be plentiful in anything other than GCRAP press releases and media interviews. ENP Superintendent Dan Kimball stated: Encounters with pythons are very rare. . . ." (Puckett, 2012). We point out that Reed and Rodda (2009) state that one python was encountered in the Everglades for every 1,318 man-days of searching. This was in 2009, the year with the highest numbers of pythons reported. Also, in the previously mentioned study of Reed et al. (2011) that also took place in 2009, standardized searching of the Frog Pond study area found zero pythons. The numbers of reported pythons from all sources in 2011 dropped nearly 50% from the 2009 high (National Park Service, www.nps.gov/ever/naturescience/burmesepython.htm.)

Let's do the math. We'll use the GCRAP numbers from 2009, even though pythons have become much more scarce since then. Then it required 1,318 man days of searching to encounter a python. A "man-day" is considered to be one person working for 8 hours, so that is 10,544 hours of searching. Let's say that person was driving rather than walking. The authors state that the speed of the vehicles used in their road surveys was 55 km/hr to 70 km/hr; we'll calculate using an average speed of 62.5 km/hr. So a person would drive an average of

659,000 km (409,484 mi) to find a python. That is a corrected sighting rate of .00015. In other words, one or fewer Burmese pythons would have been sighted in all the surveys combined and Burmese pythons would be the rarest species in this study except for those species with a csr of zero.

Of course the two methods of collection are not exactly comparable. The encounter rate when searching for Burmese pythons is undoubtedly lower because the pythons are well camouflaged when in grasses and brush. However, even if the encounter rate for road collecting is higher by a factor of 100, Burmese still would have a csr of .015, which is essentially the current csr of the raccoons [csr .02] and opossums [csr .01] in ENP that the authors declare are nearly extirpated. It is a major fault of this paper that the numbers of observed Burmese pythons, ostensibly the focus of this study, were not included in the study.

Nevertheless and not surprisingly, this paper concludes with the following transparent and self-serving statement: “The magnitude of these declines underscores the *apparent incredible density of pythons* in ENP and justifies intensive investigation into how the addition of novel apex predators affects overall ecosystem processes.” [italics ours]. We consider this statement to be an intentional, gross, and dishonest misinterpretation of the facts.

Correlation versus causation

This paper does not prove that there have been major or significant declines in most of the mammal species that were incorporated into the surveys. Even the apparent decline in raccoons and opossums are more likely the result of natural processes, diseases, normal population cycles, and the increasingly dry conditions in ENP than due to predation by a novel predator that is rare and seldom encountered. There are simply no data of any sort other than the presence of pythons to support the hypothesis of the authors that pythons are eating the ENP mammals into oblivion.

Even if there were declines in medium-sized mammals that were proven to not be the results of natural factors in the environment of populations of mammals in the ENP, this paper does not prove that Burmese pythons have had any effect of any sort on the mammals in ENP. It may be that the populations of several species have declined at the same time that the population of Burmese pythons increased but there is zero evidence that the two changes are more than random coincidence.

Gurevitch and Padilla (2004) neatly sum up our major criticism of this paper with the following observation: “Existing data on causes of extinctions and threats are, in many cases, anecdotal, speculative, or based upon limited field observation. Although it is clear that obtaining quantitative and experimental data are impossible under many circumstances, the problem remains that correlation is too often assumed to imply causation.”

Deception

To conclude, this paper is no more than a report on observations made of mammals on the roadways in and around ENP. This paper is a preliminary report that someday may be of interest to future mammal research. But this paper neither proves that

there is a decline in mammal populations, nor does it prove that Burmese pythons have had any measurable effect on mammal populations, either negative or positive.

But this paper has been adroitly used by the GCRAP camp to deceive the media and the public into believing that it was proven beyond doubt that pythons ate all the mammals. GCRAP researchers have released press releases after every paper they have published. On the day this paper was released, 30 January 2012, there was a press release that was forwarded to all the major news outlets. On that day the AP wire story by Matt Sedensky had a headline stating “Pythons apparently wiping out Everglades mammals.”

The GCRAP camp boldly seeks to advance its agenda through the media and this aberration of publicity apparently goes to the top. In a press release for this paper from USGS, Director Marcia McNutt states “Pythons are wreaking havoc on one of America’s most beautiful, treasured and naturally bountiful ecosystems” (Puckett, 2012) [This is, at best, an unproven opinion.]

A press release from Virginia Tech (Davis, 2012) begins with the deceptive and incorrect title: “Virginia Tech wildlife ecologist links severe declines in Everglades mammals with invasive pythons.” [No such link is even claimed in this paper.] In the release co-author Willson is quoted: “Our research adds to the increasing evidence that predators, whether native or exotic, exert major influence on the structure of animal communities. The effects of declining mammal populations on the overall Everglades ecosystem, which extends well beyond the national park boundaries, are likely profound, but are probably complex and difficult to predict.” [In fact, no “research” published in this paper (or any other paper on Florida pythons co-authored by Willson) produces any irrefutable, authoritative evidence that pythons have done quantifiable ecological damage of any sort.]

Co-author Reed is quoted as saying: “. . . it has apparently taken only 11 years since pythons were recognized as being established in the Everglades for researchers to implicate pythons in the same kind of severe mammal declines. . . .” (Puckett, 2012). [This is in comparison to brown tree snakes in Guam, which, in fact devastated bird populations, not mammal.]

Most quotes from authors Dorcas, Reed and Willson imply that pythons are the cause of the mammal decline, but in general they do not state that this is proven. But the media snapped up the story and it ran in almost every major media outlet that pythons had eaten 90% of the mammals in the ENP. Wayne Pacelle of the Humane Society of the United States repeated this several times in an interview on the Dianne Riehm Show on NPR. A press release on the Nature Conservancy website (Nature Conservancy, 2012) states that Kris Serbesoff-King, an associate director of conservation for the Nature Conservancy “called the drastic loss of common mammals in the Everglades due to Burmese pythons, reported by the Florida [sic] Academy of Sciences, ‘really scary’ and worries about the repercussions for all wildlife and for Everglades restoration.” [A theatrical statement that is a misinterpretation of this study and is completely misleading.]

Here the act of deception is the failure of USGS and USFWS to make any attempt to correct the media stories. By their absolute silence we assume that they were not concerned that this

research was being misinterpreted and exaggerated.

To his credit, Dr. Frank Mazzotti, one of the authors, came forth and posted a blog on the Huffington Post and stated, among other things, that “With few exceptions you would get that impression from the media coverage that hoards of rampaging snakes were vacuuming up mammals in the Everglades. We don’t know that. . . .” He goes on to give an insightful evaluation of this study, and then states that there may well be factors other than pythons that affect mammals in ENP (Mazzotti, 2012).

We note the statement at the bottom right of the first page of the paper: “The authors declare no conflict of interest.” At first we were angered—of course the GCRAP camp in general and every author of this paper has a clearly demonstrable vested interest, both financial and professional, to see that pythons are painted as being destructive and dangerous creatures wreaking havoc in south Florida. Many of the authors have directly benefited in one way or another from the more than 100 million

taxpayer dollars funded by the military and the Congress to study brown treesnakes in Guam, and all of them have received money to work on python projects in Florida. They now deliberately manipulate the media, ignore criticism, and plan to repeat their Guam success in obtaining major funding and grants as they “study” the Burmese python and the other large constrictors that will be added to the Injurious Wildlife List of the Lacey Act. Then came the realization that the authors really hadn’t lied—this is their interest and their agenda. There is no conflict.

The poor quality of the publications and the biased press releases that are issued by the federal regulatory agencies involved in the Burmese python issue in southern Florida are troubling. It’s time for the Department of Interior to change the editorial and review process of the publications and to closely monitor or restrict the direct interaction of the GCRAP camp with the media. If even the director of USGS can’t honestly and correctly represent the research supervised and funded by her agency, perhaps it’s time to clean house.

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What You Missed at the March Meeting

John Archer
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Marisa Tellez looked surprised when I mentioned that I was pleased to meet someone so famous. I suppose that her fame is limited to a small group, but as I browsed the Internet I had come across her name frequently. She was dressed in high black lace-up boots, distressed ripped hiphugger jeans, and a black T-shirt. Her curly dark hair cascaded to below her shoulders. She has a southern California accent and has lived in Los Angeles most of her life. With her petite frame she looked as though she should be a model in a Hot Topics catalog, but her claim to fame was her study of crocodilian parasites.

Because she always gets the same question, our March speaker began with the explanation of how she became involved with crocodilians and their parasites. At the age of five her father presented her with a flat package instead of the Barbie doll that she had asked for. She opened it to discover a book on the Civil War, a book on World War II, and a book on sharks. Her father said, "I'm raising a human being, not a girl." The third book captured the young human being's imagination, and soon her fascination with sharks led into a fascination with predators, and then snakes, and then alligators. Parasites didn't get involved until her senior year of college, but she fell in love with the amazing creatures after a course that year. When she was beginning her doctorate she decided to combine the two creatures that most fascinate her. She is well into her doctorate at the University of California, Los Angeles, and she gave us a glimpse into the methods of crocodilian parasite research.



Marisa Tellez. Photograph by Dick Buchholz.

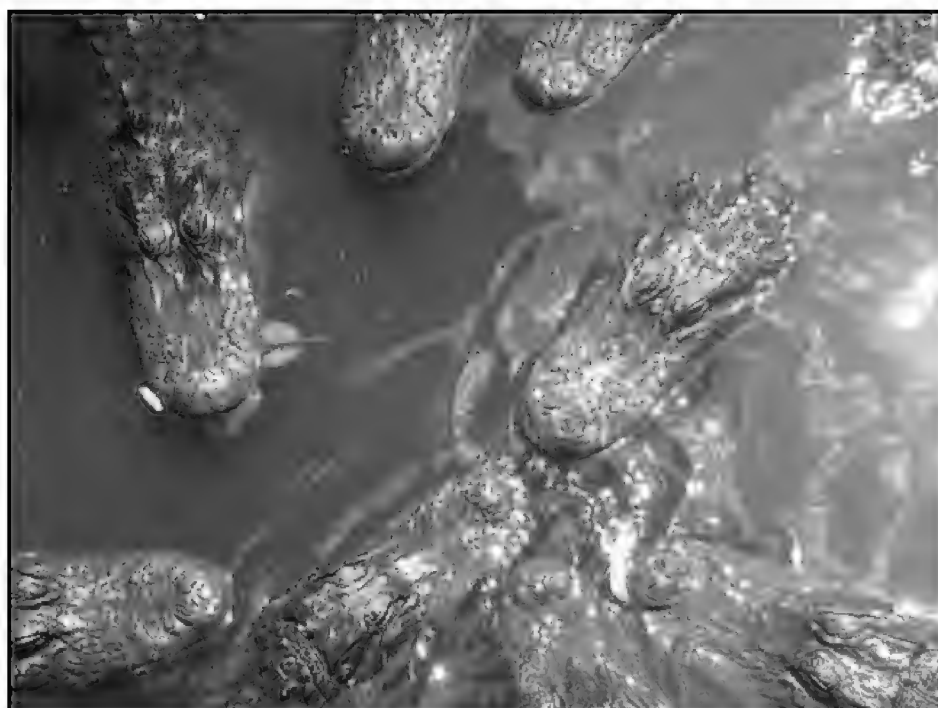
Crocodilians have been around for about 254 million years or so and the twenty-three extant species are being joined by more and more ancient species being discovered. Marisa said some scientists are thinking of renaming the late Cretaceous the "Age of Crocodilians" rather than the "Age of Dinosaurs", an exciting prospect for someone in her line. Crocodilians show adaptations that astound most people. A small but well-developed brain allows parental care and unique communication skills. They have superior olfactory capabilities, and a complex inner and middle ear receive a wide range of frequencies. A four-chambered heart has a unique appendage, the Foramen of Panizza, that allows more efficient use of blood oxygen. And crocodilians have one of the strongest immune systems in the animal world.

She cautioned us that even though crocodilians look nearly invincible, they have weaknesses. She hoped that her research could assist managers in avoiding populations succumbing to those weaknesses.

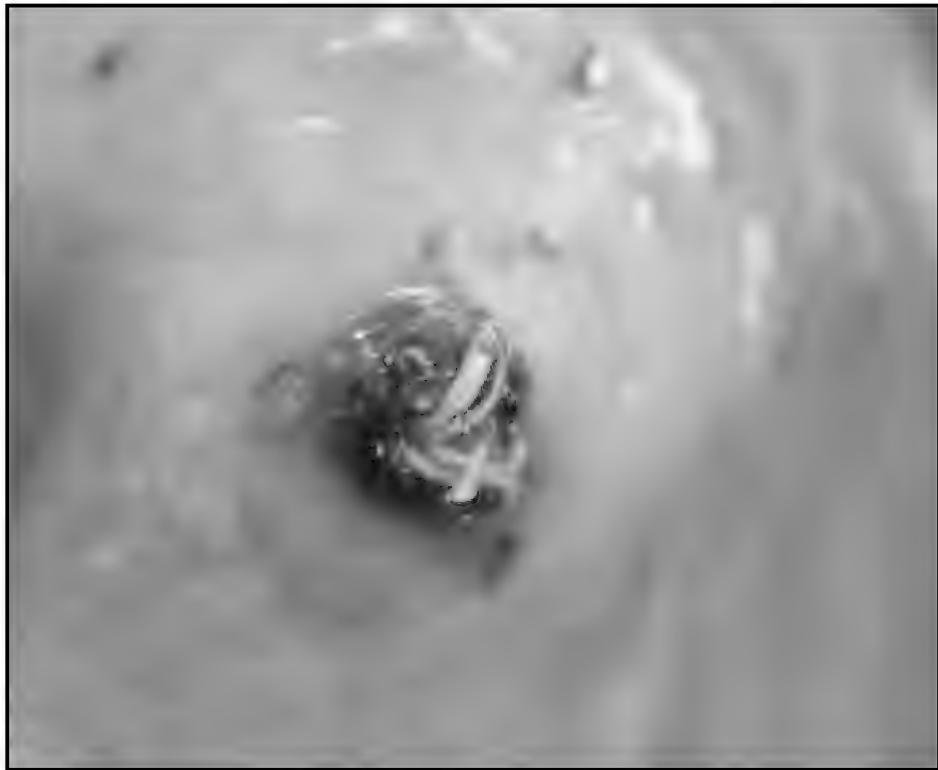
The relationship between parasites and their hosts is complex and can reveal clues to environmental and anthropogenic disturbances that effect their life cycle. Marisa headed to Louisiana to collect her data. That state has large populations of alligators (*Alligator mississippiensis*) and has suffered from environmental and anthropogenic changes in the recent past. For three years she has collected data during the alligator harvest, and has analyzed some data from the first two years. Louisiana Department of Wildlife and Fisheries divides the state into east and west populations of alligators. Marisa's biggest thrill was finding parasites in one hundred percent of the alligators she dissected, but more in the eastern population. She speculated that this may be because the eastern section of the state is more agricultural and the western state has mining and a higher salinity. Heavy metals and salt tend to decrease parasitic loads and eutrophication, aggravated by agriculture runoff, tends to increase the number of parasites.

Now the only expert in this somewhat esoteric field, Marisa was invited to study Florida alligators, so, somewhat as a lark, she made her way to Gainesville with her student assistants to look at the Florida alligators. After her 100% success rate in Louisiana, she was stunned to find no parasites in the Florida alligators. Balance is important in the host-parasite relationship and too few parasites may be as detrimental as too many. After consultation with her advisors, she has added Florida to her studies.

The complex life cycles of parasites make them possible



Alligator populations are recovering in Louisiana, and the annual harvest has allowed Marisa to dissect over 100 alligators so far. She says she's an expert in the gastrointestinal tracts of alligators.



A slide of nematodes in an alligator's stomach. Marisa called this a "fun, cool slide."

bellwethers for changes in the environment. Frequently parasites may reveal conditions that go unobserved in the hosts. The intricate life cycles can encompass not only revelations about the apex predators such as the alligator, but also the myriad other animals that depend on or are hosts in the other stages of the parasite's life. Marisa hopes that her studies can lead to

knowledge that is useful in the preservation of not only the alligator and other crocodilians, but the web of life that surrounds, supports, and relies on these creatures. She gave us a little insight into the methods she using, including niche modeling and mathematical modeling.

The presentation was filled with her passion, illustrated with neat line drawings of various parasites and photos of crocodilians, and punctuated with the sounds of a light saber. Not five minutes into her talk, Marisa, admitting to being a huge Star Wars fan, whipped out a light saber (with sound effects!) to use as a pointer. She wielded the pointer with authority, probably due to the fact that she was a champion baton twirler in younger days. She gave us pictures of her with hands buried in gator guts and waxed enthusiastic over a photo of nematodes in an alligator's stomach, which she called a "fun, cool slide." I don't think that she converted many of us into parasite lovers, but she certainly brought us to a greater appreciation of the critters. On her web site (alligatorparasites.wordpress.com) she writes an interesting blog, a recent entry mentioning her interest in capoeira, the Brazilian dance-like martial art. At diner she expressed her desire to one day manage a wildlife refuge. I think she should have no trouble achieving that. Her dad did a fine job of raising a human being who appears limited only by her desires.



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The Tympanum

Of Pythons and Pit Bulls: Pushing Back against Media Bias

People used to say “Euuuw!” when they heard I had pythons, and shiver in fear at my pit bulls. Now, those reactions are reversed.

Over the years, the pit bull community has taken a very proactive role in fighting false negative stereotypes about our dogs. For longer than I have owned dogs, people in the community have stepped out, created educational days, spent time talking about our dogs to anyone who will listen. It’s time for the python community to adopt what has been an extremely successful program for getting out the truth about our pets.

Consider the headline on an article on ctpost.com:

DEEP collects 5 illegal pets, one vicious python, at Beardsley Zoo

The article goes on to explain the surrender of a Burmese python in lurid detail:

The most exciting moment of the day occurred behind closed doors.

Overturf and EnCon officer Todd Chemacki recalled it in the back of the room.

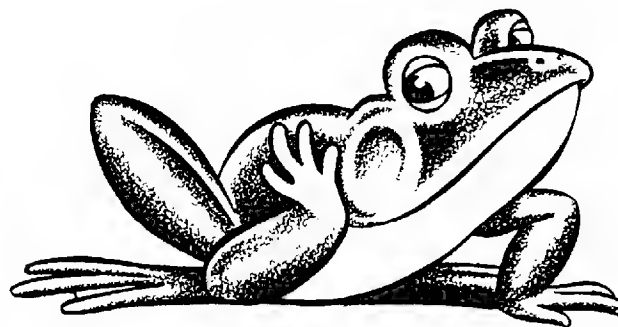
The other Burmese python was about 13 feet—and deemed too dangerous to show the public.

When Ralbovsky tried putting it into one of his bins, it struck its head at him several times, reaching waist-high. He had to pin it with a catch pole; then it took two people to get it in the bin.

Of course, the animal isn’t poisonous, Overturf granted.

“But when a snake with the head of a small dog hits you, and bites, you’ll feel it,” he said.

“And then when it wraps around you, . . .” Chemacki said.



That is the scene people who have never met a python will always remember. They’ll get the idea pythons are dangerous beasts who will strike at you and wrap around you and, presumably, send you to your scaly doom—something those of us who keep them know is a distorted and false view of our pets.

Distorted or not, stories like this fill the newscasts, papers, and websites non-snake-owning people read every day. It’s time we learned from the pit bull people and started pushing back. We need to attend Snake Day and herp society events that are occurring this spring nationwide. Offer to do presentations at local schools, camps, and community groups. Set up a booth at festivals and street fairs. We need to talk about our pets to other pet people, whenever and wherever we can. This is our opportunity to reach out and change minds.

It worked with pit bulls. It will work with pythons—if we do the work to get our voices heard. Will you start speaking out this spring? **Cindy Steinle**. [This opinion piece first appeared in Cindy’s blog for April 6, 2012, on Kingsnake.com. For more of Cindy’s blogs see <http://www.kingsnake.com/blog/authors/7-Cindy-Steinle>]



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Herpetology 2012

In this column the editorial staff presents short abstracts of herpetological articles we have found of interest. This is not an attempt to summarize all of the research papers being published; it is an attempt to increase the reader's awareness of what herpetologists have been doing and publishing. The editor assumes full responsibility for any errors or misleading statements.

TRANSLOCATED OZARK HELLBENDERS

C. M. Bodinoff et al. [2012, Copeia 2012(1):150-159] used radiotelemetry and recapture to monitor survival and body condition of 36 captive-reared Ozark hellbenders (*Cryptobranchus alleganiensis bishopi*) released at two sites on the North Fork of the White River, Missouri, from May 2008 to August 2009. At the end of our study 16 salamanders were alive, 13 had died, and the fate of seven could not be determined. Captive-reared hellbenders released at a site with densely arranged boulders exhibited approximately 1.5-fold higher annual survival (0.7467; daily survival = 0.9992 ± 0.0004 95% CI) than hellbenders released at a site where boulders were patchily distributed (0.4816; daily survival = 0.9980 ± 0.0007 95% CI). When compared to log-transformed length–mass relationships developed for wild hellbenders from the same river in the 1970s, mean body condition of hellbenders at the patchy boulder site was about average at the end of the study (mean residual distance = -0.0273 ± 0.0234 SE, $n = 7$; range = -0.1375 – -0.0486), while mean body condition of hellbenders at the dense boulder site was above average (mean residual distance = 0.0423 ± 0.0402 SE; $n = 8$; range = -0.0374 – 0.1088). In addition to lower survivorship and body condition, a greater proportion of hellbenders at the patchy site accrued physical abnormalities (6 of 13 vs. 2 of 14), carried leech parasites (9 of 16 vs. 4 of 14), and carried the fungus *Batrachochytrium dendrobatidis* (3 of 11 vs. 1 of 13). A “site only” model of survival was most supported, though additional supported models suggested increased mass at release may have increased daily survivorship. While more work is needed to determine the impact of translocation on long-term population dynamics of Ozark hellbenders, this study demonstrated that about half of a translocated population of captive-reared hellbenders can survive while maintaining or increasing in body condition during their first year post-release, given release sites are well selected.

EFFECT OF TAIL-CLIPPING

A. Herrel et al. [2012, J. Herpetology 46(1):91-93] note that toe and tail clipping are commonly used methods for permanent marking of animals and for obtaining tissue samples. Although it has been tested whether toe clipping affects locomotor performance (and thus potentially the fitness of an individual), little is known about the effect of tail clipping. Tails are important organs in many amphibians and reptiles and are used for balance or stability during locomotion or as prehensile organs. Effects of tail autotomy or the removal of large parts of the tail have previously been demonstrated. This study tests whether removal of a small part (<5 mm) of the distal tail in chameleons affects their ability to cling to branches of different diameters by measuring gripping strength using of a force platform. The data show no significant or directional effect of tail clipping on the maximal forces that can be generated by the tail and, thus, suggest that tail clipping can be used as a method for tissue collection.

USE OF CHEMICAL CUES BY ROSY BOAS

R. W. Clark and G. Ramirez [2011, The Herpetological Journal 21(3):187-191] note that laboratory studies focusing on the ability of squamate reptiles to discriminate among prey chemical cues have been the foundation for many important contributions in animal behavior and ecology. This study examined the ability of rosy boas (*Lichanura trivirgata*) to discriminate among several sources of prey chemicals. Because of the high frequency of neonatal mammals in the diet of erycine boas, the study was focused on chemical cues from female mice (*Mus musculus*) with and without litters of dependent young. Chemical stimuli were presented on cotton-tipped applicators in one set of experiments; in a second set chemical cues were presented as trails placed in an observation arena with test subjects. The cotton swab assays did not reveal a difference in response to prey chemical cues, but in the arena-based assays it was found that snakes showed an attraction to chemical cues from female mice with litters of young. This attraction could be caused by either the feeding experiences of these individuals, an innate ability to recognize chemical cues from neonatal mammals, or both.

COLOR PATTERNS IN DARWIN'S FROGS

J. Bourke et al. [2011, The Herpetological Journal 21(4):227-234] demonstrate that Darwin's frogs (*Rhinoderma darwinii*) show sex differences in dorsal pattern and body coloration. Males possessed higher variability than females, which were mainly brown; two dorsal patterns and a green body color were found exclusively in males. Males at different reproductive stages differed significantly in body color and dorsal pattern; brooding males were characterized by being greener. Females—almost exclusively brown—were mostly found on brown substrates, whereas males were distributed across brown, green and brown/green substrates. An association between body and substrate coloration suggests crypsis to reduce predation risk.

GREEN RACERS IN NORTHEAST BRAZIL

P. C. M. D. de Mesquita et al. [2011, The Herpetological Journal 21(3):193-198] describe, through hypothesis testing and observations on life-history traits, the ecology of the Paraguay green racer, *Philodryas nattereri*, in a semi-arid region in northeast Brazil, where it is widespread and occurs at high abundance. They document sexual dimorphism in snout–vent length and relative tail length. The species is diurnal and semi-arboreal, and most active during the warmest periods of the day. It is active year-round, with peaks of activity during periods of maximum precipitation and temperature. Adults feed on a variety of prey types, whereas juveniles are lizard specialists. The reproductive season extends over at least nine months of the year. The authors conclude that, due to its high abundance, foraging skills and fecundity, *P. nattereri* is a major predator in the Brazilian semi-arid region.

HERP-ACROSTIC #21 by Mike Dloogatch

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137	G	138	H	139	P	140	T		141	U	142	H	143	E	144	Q	145	S	146	M	147	C	148	P	149	B		150	K	151	S	152	L	153	Q	154	M		155	O	156	J	157	T	158	Q
159	K		160	D	161	C	162	I	163	P																																				
	—																																													

How to solve this puzzle: The diagram, when filled in, will contain a quotation from a published work on herpetology. The numbered squares in the diagram correspond to the numbered blanks under the WORDS. The letter at the upper right of each square indicates the WORD containing the letter to be entered in that square. The WORDS form an acrostic: taking the first letter of each in order spells out the name of the author and the title of the work from which the quotation is taken.

CLUES	WORDS	
A. _____ treefrog, <i>Litoria caerulea</i> .	_____ 102 91 133 46 107 58	L. Widely cultivated herb of the lily family. _____ 152 120 21 25 65
B. Author in 2007 of <i>Boas and Pythons of the World</i> (last name only).	_____ 64 149 106 55 41	M. FTD, for one. _____ 23 132 78 50 146 69 154
C. _____ snake, <i>Farancia erytrogramma</i> .	_____ 93 113 161 42 30 147 122	N. They're in the genus <i>Psammobates</i> (two words). _____ 18 112 77 126 57 5 108 13 85 _____ 47 121 10 89
D. Any snake of the family Bolyeridae (three words).	_____ 124 127 67 6 20 71 51 114 99 _____ 135 84 160 2 15	O. Informally, any snake of the genera <i>Ficimia</i> and <i>Gyalopion</i> . _____ 1 136 98 16 86 82 155 103
E. In taxonomy, the second word of a binomial name of a species.	_____ 143 40 130 70 28 94 105	P. Restricted to a particular region or habitat. _____ 139 148 8 163 26 56 60
F. Followed by word G, habitat for many small species of herpetofauna and their invertebrate prey.	_____ 4 17 110 35	Q. Frogs of the genus <i>Arthroleptis</i> . _____ 101 66 153 22 53 158 87 44 144
G. See clue F.	_____ 131 12 32 137 123 24	R. Likely equipment item for a lizard biologist. _____ 52 83 61 115 68
H. Region covered by a 2010 reptile field guide by Indraneil Das (two words).	_____ 11 43 142 90 138 33 59 125 79 _____ 36 96 39 128	S. Naturalist and collector (1860–1936) after whom a day gecko and an anglehead lizard were named (last name only). _____ 88 74 151 34 37 145
I. _____ viper, <i>Montivipera xanthina</i> .	_____ 134 14 162 19 63 119 97	T. Likely prey item for a desert rattlesnake (two words). _____ 54 157 73 7 45 140 9 118 104 _____ 80 27
J. Like a subspecies for which the subspecific name is the same as the specific name.	_____ 156 72 62 95 100 38 76 49	U. Horselike. _____ 92 141 75 31 117 109
K. Former reptile curator at the Taronga Zoo (first and last names).	_____ 48 111 150 159 129 29 81 116 3	

Unofficial Minutes of the CHS Board Meeting, March 23, 2012

The meeting was called to order at 7:47 P.M. at the Wildlife Discovery Center in Lake Forest.. Board members Jim Foster, Barbara Khan, Andy Malawy and Linda Malawy were not present.

Officers' Reports

Recording Secretary: The minutes of the February 17 board meeting were read, corrected, and accepted.

Treasurer: Andy was absent. The February financial report was discussed and accepted.

Membership Secretary: Membership continues to increase over last year.

Vice-president: Programs are confirmed for every month but August this year.

Sergeant-at-arms: Attendance at the February meeting was 61.

Committee Reports

Shows:

- Notebaert, first full weekend of each month. Josh Chernoff is coordinator.

Adoptions: Linda has several new animals coming in.

Reptilefest: School advertising is going well. T-shirts are ordered. Paul Sereno will speak on Sunday at 11 A.M..

Old Business

NARBC table: We need more CHS participation in the future, perhaps setting a schedule to be sure our tables are staffed.

Bulletin articles: Mike is always looking for articles to put in the Bulletin. Several have been submitted recently.

IL Senate bill SB3264: Action has been temporarily postponed, but we still need to address our response, since it will come up again.

Legal summit at NARBC: A council has been formed to address legal issues regarding the herpetological community, The National Reptile and Amphibian Advisory Council (NRAAC.org).

Banners: Jason will order new banners for fest and future events.

New Business

Junior Herpers program: Discussion regarding ways to implement a program as something new to stimulate interest in the Society. J.T. Turingan will head a committee to look into it.

National Herpetological Society: Jason Hood has been contacted about formation of a national society to support smaller regional societies and promote the exchange of ideas and information throughout the herpetological community.

Zoo trips: There was some discussion regarding ideas for future trips.

Round Table

Bob Bavirsha thanked Rob Carmichael for hosting the meeting tonight. The Little Red Schoolhouse has offered to host a future meeting.

J. T. Turingan hopes numbers at Fest will increase this year.

Lawrence Huddleston reported that Petco is looking for someone to do a crested gecko meet and greet.

The meeting was adjourned at 9:27 P.M.

Respectfully submitted by recording secretary Jenny Vollman

Advertisements

For sale: rats and mice—pinkies, fuzzies and adults. Quantity discounts. Please send a SASE for pricelist or call Bill Brant, *THE GOURMET RODENT*, PO Box 430, Newberry, FL 32669-0430, 352-472-9189, E-mail: GrmtRodent@aol.com.

For sale: from **The Mouse Factory**, producing superior quality, frozen feeder mice and rats. Our mice and rats are vacuum-packed to greatly extend freezer life by reducing freezer burning and preserving vitamin and nutrient content. We feed our colony a nutritionally balanced diet of rodent chow, formulated especially for us, and four types of natural whole grains and seeds. For a complete price list please visit our web site, www.themousefactory.com. We accept all major credit cards, PayPal or money orders. Call us **toll-free** (800) 720-0076 or send us an e-mail at info@themousefactory.com. Write us at PO Box 85, Alpine TX 79831.

For sale: **highest quality frozen rodents**. I have been raising rodents for over 30 years and can supply you with the highest quality mice available in the U.S. These are always exceptionally clean and healthy with no urine odor or mixed in bedding. I feed these to my own reptile collection exclusively and so make sure they are the best available. All rodents are produced from my personal breeding colony and are fed exceptional high protein, low fat rodent diets; no dog food is ever used. Additionally, all mice are flash frozen and are separate in the bag, not frozen together. I also have ultra low shipping prices to most areas of the U.S. and can beat others shipping prices considerably. I specialize in the smaller mice sizes and currently have the following four sizes available: Small pink mice (1 day old—1 gm) , \$25 /100; Large pink mice (4 to 5 days old—2 to 3 gm), \$27.50 /100; Small fuzzy mice (7 to 8 days old—5 to 6 gm) , \$30/100; Large fuzzy mice /hoppers (10 to 12 days old—8 to 10 gm), \$35/100 Contact Kelly Haller at 785-234-3358 or by e-mail at kelhal56@hotmail.com

Herp tours: **Costa Rica herping adventures**. Join a small group of fellow herpers for 7 herp-filled days. We find all types of herps, mammals, birds, and insects, but our target is snakes. We average 52 per trip, and this is our 10th year doing it. If you would like to enjoy finding herps in the wild and sleep in a bed at night with air-conditioning, hot water and only unpack your suitcase once, instead of daily, then this is the place to do it. Go to our web-site <http://hiss-n-things.com> and read the highlights of our trips. Read the statistics of each trip and visit the link showing photos of the 40 different species we have found along the way. E-mail at jim.kavney@gmail.com or call Jim Kavney, 305-664-2881.

Line ads in this publication are run free for CHS members—\$2 per line for nonmembers. Any ad may be refused at the discretion of the Editor. Submit ads to mdloogatch@chicagoherp.org.

UPCOMING MEETINGS

The next meeting of the Chicago Herpetological Society will be held at 7:30 P.M., Wednesday, April 25, at the Peggy Notebaert Nature Museum, Cannon Drive and Fullerton Parkway, in Chicago. **Doug Hotle**, curator of herpetology at the Rio Grande Zoo in Albuquerque, New Mexico, will speak about the Albuquerque BioPark's Native Species Recovery Program.

Speaking at the May 30 meeting will be **Tony Gamble**, a postdoctoral researcher at the University of Minnesota. Tony's talk will be about geckos, but we don't have a title just yet.

The regular monthly meetings of the Chicago Herpetological Society take place at Chicago's newest museum—the **Peggy Notebaert Nature Museum**. This beautiful building is at Fullerton Parkway and Cannon Drive, directly across Fullerton from the Lincoln Park Zoo. Meetings are held the last Wednesday of each month, from 7:30 P.M. through 9:30 P.M. Parking is free on Cannon Drive. A plethora of CTA buses stop nearby.

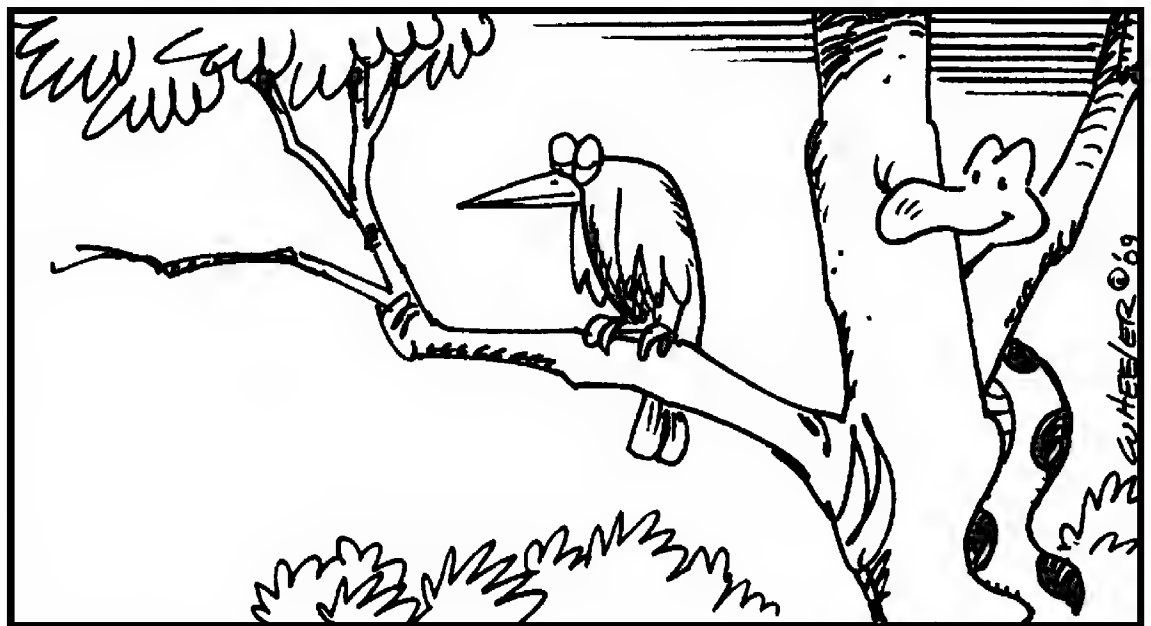
Board of Directors Meeting

Are you interested in how the decisions are made that determine how the Chicago Herpetological Society runs? And would you like to have input into those decisions? If so, mark your calendar for the next board meeting, to be held at 7:30 P.M., May 18, in the adult meeting room on the second floor of the Schaumburg Township District Library, 130 S. Roselle Road, Schaumburg.

The Chicago Turtle Club

The monthly meetings of the Chicago Turtle Club are informal; questions, children and animals are welcome. Meetings normally take place at the North Park Village Nature Center, 5801 N. Pulaski, in Chicago. Parking is free. For more info visit the group's Facebook page.

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Affiliated with the Chicago Academy of Sciences

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BULLETIN

of the

Chicago Herpetological Society



Volume 47, Number 5
May 2012



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The Future of Map Turtles: Will the Mutts Take Over?	David S. Lee	57
Historical Sightings and Recent Surveys of the Herpetofauna of the James River Park System	Stephen R. Johnson	62
The Tympanum	Dan Zeh	64
Answers to Herp-Acrostic #21		65
Herpetology 2012		66
Advertisements		68

Cover: Northern map turtle, *Graptemys geographica*, from the DesPlaines River, Will County, Illinois. Photograph by Michael Redmer.

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The Chicago Herpetological Society is a nonprofit organization incorporated under the laws of the state of Illinois. Its purposes are education, conservation and the advancement of herpetology. Meetings are announced in this publication, and are normally held at 7:30 P.M., the last Wednesday of each month.

Membership in the CHS includes a subscription to the monthly *Bulletin*. Annual dues are: Individual Membership, \$25.00; Family Membership, \$28.00; Sustaining Membership, \$50.00; Contributing Membership, \$100.00; Institutional Membership, \$38.00. Remittance must be made in U.S. funds. Subscribers outside the U.S. must add \$12.00 for postage. Send membership dues or address changes to: Chicago Herpetological Society, Membership Secretary, 2430 N. Cannon Drive, Chicago, IL 60614.

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The Future of Map Turtles: Will the Mutts Take Over?

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Mapping the distributions of our native map turtles could soon become an exercise of historical interest.

The southeastern United States has the greatest aquatic diversity of any place on earth. I first became aware of this in the mid-1970s while compiling an atlas of the freshwater fishes of North America (Lee et al., 1980). Of the 770+ species of freshwater fishes then known from North America, 580 (75%) occur in the Southeast. Subsequently a number of additional species have been described, with the majority of these also dwelling in the Southeast. The diversity is not limited to fishes. Reptiles and amphibians, crayfish, freshwater mollusks and aquatic insects are all well represented, and many are endemic to specific drainage systems. North of the Potomac River, south of central Florida, and west of central Texas this diversity of native fauna declines rapidly as does endemicism. Overviews of this can be found in Holt (1972) and Hackney et al. (1992); the pattern is irrefutable. It can be seen by simply thumbing through distribution maps of almost any field guide. The diversity of freshwater turtles in southeastern North America is particularly impressive and rivaled only by the chelonian fauna assemblage of Southeast Asia.

One group of aquatic turtles exhibiting a surprising amount of diversity in southeastern North America is the genus *Graptemys*. Of the 12 recognized species, 9 (75%) are endemic to specific rivers or river basins and for the most part these each have relatively limited distributions. Half of these species were not even recognized prior to 1950, and several were not described until the early 1990s. Over half are at some level of conservation concern, and all are listed as CITES Appendix II or III species (U.S. Fish and Wildlife Service, 2005). A brief overview of the 9 endemic and three wider ranging species, as well as their current conservation status follows:

Endemic species:

Barbour's Map Turtle, *Graptemys barbouri*. Florida and Georgia: Apalachicola River, as well as sections of the Choctaw-hatchee, Aucilla, Wacissa and Ochlockonee Rivers. IUNC low risk/nearly threatened, proposed for listing by the U.S. Fish and Wildlife Service (USFWS).

Cagle's Map Turtle, *Graptemys caglei*. Texas: Guadalupe and San Antonio Rivers, may be extirpated from the latter. IUNC vulnerable.

Escambia Map Turtle, *Graptemys ernsti*. Florida and Alabama: Rivers flowing into Pensacola Bay and the Pea and Choctaw-hatchee Rivers. IUNC low risk/nearly threatened, proposed for listing by USFWS.

Yellow-blotched Map Turtle, *Graptemys flavimaculata*. Mississippi: Pascagoula River. USFWS threatened, IUNC endangered.

Pascagoula Map Turtle, *Graptemys gibbonsi*. Mississippi and

Louisiana: Pascagoula and Pearl Rivers. IUNC low risk/nearly threatened, proposed for listing by USFWS.

Black-knobbed Map Turtle, *Graptemys nigrinoda*. Alabama and Mississippi: Alabama, Tombigbee, Black Warrior, Coosa, Tallapoosa and Cahaba Rivers. IUNC low risk/nearly threatened, proposed for listing by USFWS.

Ringed Map Turtle, *Graptemys oculifera*. Mississippi and Louisiana: Pearl River. USFWS threatened, IUNC endangered.

Alabama Map Turtle, *Graptemys pulchra*. Alabama, Georgia and Mississippi: Mobile Bay drainage. Proposed for listing by USFWS.

Texas Map Turtle, *Graptemys versa*. Texas: Colorado River drainage on the Edwards Plateau. IUNC low risk/threatened.

Wide-ranging species:

Northern Map Turtle, *Graptemys geographica*. Upper Mississippi Basin, the Great Lakes region, and the Susquehanna, Juniata, Delaware and Hudson Rivers.

Ouachita Map Turtle, *Graptemys ouachitensis*. Mississippi Basin.

False Map Turtle, *Graptemys pseudogeographica*. Mississippi Basin.

While the majority of these species are endemic to specific drainages and states, collectively they also present an interesting mosaic of allopatric and sympatric distributions. The complexity of this faunal assemblage was not fully appreciated until the early 1990s (Lovich and McCoy, 1992). While the range maps depicted in various publications show the general distributions of each species, to some degree these maps are misleading in that the turtles themselves are mostly restricted to just the actual rivers and not the entire river basin. Furthermore, many of these map turtles occur only in major portions of the rivers, and are absent from 1st and 2nd order streams and impounded sections of the rivers; rarely are they found throughout the entire river system. Pollution and habitat destruction have clearly also taken a toll. For example, the northern map turtle was apparently extirpated from the Allegheny River in Pennsylvania due to degradation from pollution (Hulse et al., 2001). Acid mine wastes are believed to have had a major impact on much of the former indigenous aquatic fauna of the Allegheny River system (Ortman, 1913). Reduction in the size of populations and the occurrence of isolated relict populations resulting from impoundments and similar habitat alterations, as discussed below, will make any of the species vulnerable to genetic pollution from the release of pet-trade turtles.

Map turtles have been in the pet trade since the 1950s. As a

child I recall seeing them for sale in Maryland pet stores in the mid-'50s. However, today's market has been enhanced both in volume and in commercial distribution. Because of this, pet trade introductions of false map turtles occur well outside the species' natural range (Barbour and Lovich, 2009), and this includes foreign countries. Haffner (1997), for example, reported this species as being introduced in France. Natural hybridization within this genus has not been formerly addressed, due in part to the allopatric distributions of the majority of species. However, map turtles raised on turtle farms readily hybridize. This is a result of mixed species assemblages used as breeding stock. A decade or so back, I sorted through a shipment of several hundred farm-hatched map turtles looking for hatchlings of various species to photograph. All of the individuals in the shipment exhibited signs of hybridization, and I suspect they were not simply hybrids, but that the parent stocks were mostly hybrids as well. Otherwise some random percentage of the pairings should have been right. The turtles being sold were almost certainly varying combinations, and re-combinations, of false, Ouachita, and Mississippi map turtles. A DNA study of these commercial farm pond hybrid swarms would be interesting, but I trust there are more important ways to best spend much needed turtle research funds.

I visited the Daytona Beach tourist and tee shirt shops on Florida's route A1A in September 2011. At least four shops had signs advertising that they were selling "live baby turtles" (Figure 1). I did not check any of the similar stores but suspect many of the others were also selling turtles. Each of the shops displayed 50 to 130 hatchling turtles that sold from \$12.00 to \$14.95 each. They also sold "turtle set ups," which included a container, a year's supply of food and a turtle. The prices of these varied from shop to shop and ranged from \$20 to \$49.99 depending on the size of the container. The "large" containers were the traditional oval plastic bowls with an island and a plastic palm tree. The islands were so small and low that they

would only hold one turtle, and unless water covered the top of the island it would not be deep enough to cover the turtle's shell when they were swimming. The small "set ups" were simply clear plastic boxes that would be the right size for filing 3×5 index cards. The turtles themselves were crowded into tanks (Figure 2), one of which had extremely dirty water. Filthy may be a better term. Signs stated they were "yellow-bellied turtles." One store had 100+ map turtles and 15–20 yellow-bellied sliders, and one had 10 or so map turtles and about 30 sliders. The other two stores were each selling 100+ map turtles. They at first appeared to be mostly false map turtles, but there was a lot of individual variation and signage stated that customers were not allowed to handle the turtles. It would have been informative to examine them closely. When I asked the sales personnel about the turtles they had no idea as to what type of turtles they were, let alone which species.

In previous years these same shops sold mostly hatchling red-eared sliders (*Trachemys scripta elegans*), at similar prices, and sometimes given free if the "turtle set ups" were purchased. The latter gimmick was an attempt to get around the federal regulation prohibiting the sale of turtles under four inches.

Recently Florida passed regulations that stopped the sale of red-eared sliders because released pet turtles were becoming established and were competing and interbreeding with native species. As of 1 July 2007, red-eared sliders could no longer be sold in the state, and after 1 January 2008, it was illegal for non-licensed people to have a red-eared slider under four inches in carapace length. The intent of this regulation is different than the federal one banning the sale of turtles under four inches due to health risk to children. Florida considers the sliders to be injurious wildlife, and the state's wildlife agency was concerned about the growing numbers of unwanted pets that were being released (Lee, 2010). The response of the turtle farmers and retail dealers was simply to provide different turtles. Red-eared



Figure 1. Tourist shops in Daytona Beach, Florida, advertising the sale of "baby" turtles. September 2011.



Figure 2. Map turtles and yellow-bellied sliders for sale in tourist shops in Daytona Beach, Florida. September 2011. Variation in map turtle head patterns is suggestive of intra-generic hybridization. Note the plastic boxes behind the display, the small turtle “set ups” being sold with the purchase of a turtle.

sliders were crossbred with yellow-bellied sliders and the Florida sales continued. This is interesting in that one of the major intents of the regulation was to prevent intergradations in wild populations from released turtles. In addition hieroglyphic river cooters (*Pseudemys concinna hieroglyphica*) also appeared in shops in Florida. While hieroglyphic cooters are no longer considered a valid taxon (Seidel, 1994) this current realignment of the subspecies of cooters has been questioned (Jackson, 1995). Whatever proves to be correct is of little relevance here. Genetic scrambling within the species and subspecies of *Pseudemys* in Florida and elsewhere becomes likely with the mass introduction of this genus into the pet trade. And now we see mass numbers of *Graptemys* added to the equation.

The obvious problem is that the current regulations have simply resulted in the exchange of one issue for several others. Concerns of introduced injurious wildlife are of course not limited to turtles, but here is a case where there was concern for mass intergradations of red-eared sliders with the native subspecies—the yellow-bellied slider. With the shift in sales to cooters and genetic designer sliders (*scripta* × *elegans*) to circumvent the law, the entire intent of the new regulations was immediately nullified. Now with the use of various species of *Graptemys* and their hybrids by the pet trade any number of wild populations of map turtles could quickly become genetically compromised. In addition, even if map turtles become established in drainage systems in the Southeast that do not harbor native map turtles other native fauna—most notably endemic freshwater mollusks—could be jeopardized. The fact that Daytona is a popular tourist destination makes it inevitable that the pet-trade map turtles will become widely distributed, and as in red-eared sliders, feral populations are likely to spring up most anywhere. Unless state regulations are developed in conjunction with neighboring states they are at best ineffective in slowing the establishment of feral populations. The spread of feral turtles resulting from the release of pet turtles is not controlled by individual state regulations as states share drainage basins with adjacent ones. The problem is exacerbated by the fact that tee shirt and beachwear shops in tourist communities are selling the pet turtles so they become dispersed widely by their clientele. States with stricter regulations and enforcement fail to benefit from their efforts in that these turtles continually enter their state as a result of the travels

of vacationing families. How can we realistically expect to educate the general public about the irresponsibility of releasing cute pet turtles that have outgrown their aquariums (Sellers and Lee, in press)?

The fact that many of our species of map turtles are of global (IUCN), national (USFWS), or regional (state listings) conservation concern is important, but even wide-ranging species, or apparently stable endemic species, still remain vulnerable to genetic swamping by introduced feral species and their hybrids. Populations could exhibit major genetic pollution issues within decades. While agencies recognize the problems involved with habitat loss, in many cases direct and indirect threats from exotic species remain unaddressed, debated, circumvented or dismissed.

In October 2011 the late Joe Collins, creator of The Center for North American Herpetology, released a report that the U.S. Fish and Wildlife Service was looking at the status of a number of southeastern freshwater species. The list included 5 map turtles as well as 23 other species of reptiles and amphibians from 13 southeastern states. The original request to reevaluate the status of some 374 different aquatic species came from the Center for Biological Diversity (2011) and was cosponsored by a number of southeastern regional conservation organizations. Within days herp hobby groups began circulating emails addressing their concerns that this could infringe on their rights to keep and sell many of these species. The turtle interest groups were particularly outspoken. As usual the commercial herp community was not particularly concerned about the species’ well-being in the wild, but they were very alarmed that possible additional listings under the Endangered Species Act might hurt them economically. It was clear that they had no interest in supporting the pending protection of any these species.

The threat of extensive and widespread hybridization resulting from the release of unwanted pet turtles is real. In North Carolina, for example, the state passed regulations prohibiting the sale of any turtles of any size as pets. This was done in conjunction with the Federal Food and Drug Administration’s 1975 act preventing sales of turtles under four inches. Yet, today the sliders found around Raleigh and other major cities in the state are mostly intergrades between the native yellow-bellied slider, *Trachemys scripta scripta*, and the pet trade red-eared

sliders, *T. s. elegans*. This is in spite of a formerly large population of the native subspecies and a well-enforced ban of sales of pet turtles within the state. While clearly some of the introductions were prior to 1975, unwanted turtles continue to be released in local waters. This is a result of the large numbers of red-eared sliders that continue to be sold in tourist shops in Myrtle Beach, South Carolina. Myrtle Beach is a popular tourist designation for North Carolina residents, and is located just across the state line.

While state wildlife agencies have been doing a good job of managing game species for nearly a century, reptiles and amphibians and other nongame responsibilities were really not under most states' jurisdiction until the early 1970s. Meaningful programs were slow to develop, and in many cases major issues still remain to be addressed. Most states have developed laws that address native species with limited or no provisions for species or subspecies protected in other states, and there is considerable variation in the strength and level of enforcement from state to state. The Florida regulations addressing the sale of red-eared sliders was clearly well intended, but the pet industry in their efforts to circumvent it, have not only nullified the concept of preventing injurious wildlife introductions with the substitution of *scripta* × *elegans* intergrades into the pet market,

but now we see the genetic diversity of the southeastern *Graptemys* complex potentially compromised. Florida more than any other state has seen the detrimental effect of exotic plants and animals on its various ecosystems. I have no doubt that they will redraft regulations to effectively address these issues. But all of this takes time, and the pet turtle market will continue to sell turtles to visiting tourists.

The interim solution is simple. The FDA has regulations in place prohibiting the sale of turtles under four inches. "Public distribution . . . in connection with a business . . . shall be subject to a fine of not more than \$1,000 or imprisonment for not more than 1 year, or both, for each violation, in accordance with section 368 of the Public Health Service Act (42 U.S.C. 217)." States have the power to enforce this act, and several southeastern states are doing this very effectively. Long-term solutions will require better federal regulations of commercial sales of all species of turtles. However, it is possible that the pet industry itself, and their advertisers, could self regulate the business and perhaps make meaningful reptile and amphibian conservation a key component of their business plans. More effort needs to put into educational campaigns to inform the general public of the endless cycle of health, humanitarian, and conservation issues created by the turtle farms.

Addendum

I realize all these articles on the mass production of disposable pet trade turtles are sounding like a broken record, but issues continue to evolve more quickly than solutions. The purpose of this note is to provide several points that I overlooked, and others that came to light just after this article had been submitted.

In my attempt to outline the species composition of the genus *Graptemys* I forgot to include the most recently described species. There are actually 13 currently recognized species, ten of which are endemic to specific drainage basins or small geographic areas. The Pearl River population of what was formerly the Pascagoula map turtle has been elevated to a full species.

Pearl River Map Turtle, *Graptemys pearlensis*. Mississippi and eastern Louisiana, endemic to the Pearl River. Due to its recent recognition as a distinct species (Ennen et al., 2010) the conservation status of this species has not yet been fully addressed. The species has been proposed as threatened by the IUCN (van Dijk, 2011). In addition, in that the distribution of the Pascagoula map turtle, *Graptemys gibbonsi*, is now limited to just the Pascagoula River, arguments in favor of the proposed listing of that species by the USFWS under the Endangered Species Act are also strengthened. In terms of the potential for hybridization with pet trade released map turtles this not only adds one more endemic species to be concerned about, but it reduces the range of *G. gibbonsi* by about half, making it more vulnerable to possible genetic pollution.

The U.S. Fish and Wildlife Service published an "undecided" position in April 2012 regarding the inclusion of *Graptemys* for a CITES II listing (U.S. Fish and Wildlife Service, 2012a). The wording of this ruling is as follows:

22. Map turtles (*Graptemys* spp.) - Inclusion in Appendix II and three species in Appendix I
There are 12 or 13 species of North American map turtles (*Graptemys* spp.), depending on taxonomy. The SSN recommended that the United States propose 3 species of map turtle (*G. caglei*, *G. gibbonsi* [sic], and *G. pearlensis*) for inclusion in Appendix I and the remaining map turtles for inclusion in Appendix II. The WCS, CBD, and the IUCN Tortoise and Freshwater Turtle Specialist Group recommended that the United States propose all map turtles for inclusion in Appendix II, noting the recommendations of the Conservation Working Group at the St. Louis U.S. Turtle Trade Workshop held in September 2010. This genus is for the most part endemic to the United States with one species (*G. geographica*) extending into Canada. Map turtles are popular in the pet trade and may also be sold for human consumption. They are protected to varying degrees by State laws within the United States. Two species of map turtles (*G. flavimaculata* and *G. oculifera*) are protected under the ESA. The United States included map turtles in Appendix III on June 14, 2006. Trade data (1999 and 2010) indicate that the United States exports about 226,000 live specimens per year. Currently we are monitoring trade in these species, assessing the effectiveness of their inclusion in Appendix III, and working with the AFWA CITES representatives who are coordinating with the States to ensure conservation of these species. As a result, the United States remains undecided about proposing to include the species in Appendix I or II, pending consultations with the AFWA CITES representatives and Canada and the availability of additional information. We seek further information about the species' population status, threats to the species, and, in particular, the impact to the species from international trade.

An abbreviated version of the above was published in the Federal Register on 11 April 2012. Since 14 June 2006, all map turtles still remain listed under Appendix III (CITES, 2011).

My primary concerns on the mass marketing of pet hatchling map turtles to the general public were the problems this can cause in turning our various endemic map turtle populations into genetic swarms, but like red-eared sliders, map turtles can also

transmit *Salmonella* to small children and people with immunity disorders. Not only was one of the stores in Daytona displaying the hatchlings in dirty water, a number of the turtles had sores on their necks and other signs of infections. The problems with aquatic turtles and *Salmonella*, while a different issue entirely from the environmental concerns, are not imagined ones. Nor are they without serious consequence.

The warning below is condensed from a news release posted on the Internet just before Easter, and the start-up of the spring market for baby bunnies, chickens and turtles (Worcester County Health Department, 2012):

Maryland's Department of Health and Mental Hygiene is reminding parents that baby animals can pass *Salmonella* and other harmful bacteria to people.

The Centers for Disease Control (CDC) has been researching and investigating three *Salmonella* outbreaks that are ongoing and associated with turtle exposures. The outbreaks have been linked to 63 people in 16 states.

Six Maryland residents have been identified as having an infection linked to the outbreaks. All six cases reported exposure to a baby turtle.

Three of those cases were from people who had bought the baby turtle. The U.S. Food and Drug Administration strictly prohibits the sale of pet turtles with shells that are four inches or smaller.

For several decades I have attempted to address, or at least expose, the inconsistency in state, federal and various agency regulations and their enforcement regarding turtle conservation.

An online publication is now available that reviews the current regulations regarding amphibians and reptiles native to the United States (U.S. Fish and Wildlife Service, 2012b). This report is up to date through February 2012. The report shows that all 13 species of map turtles are protected in one or more states. Thirteen different states, most of them in the Southeast, have at least one species listed as in need of protection. Mississippi protects eight. Many are listed as state endangered or threatened, while others are listed as having some form of additional protection within that state. One of the primary goals of this report is to "Facilitate communication and collaboration among states to address challenges in regulating amphibian and reptile use and in enforcing existing laws." Hopefully this document will become an important tool for redrafting current laws so that our native species can receive more adequate and uniform protection from commercial interests that now successfully move animals to states with weak regulations to "legalize" their sales. Unfortunately such a document does not exist for species occurring outside of the United States, and for commercial wildlife dealers, reptile expo events, and chain pet stores this online resource will become a handy map for circumventing existing state laws.

Let's watch.

I thank Katrina Smith, Peter Paul van Dijk, and Jeff Lovich for bringing my attention to much of the information presented here. I must add that I was pleased to see the son of one of my long-term friends as co-author of an account of the Pearl River map (Ennen et al., 2012). I recall several decades ago, in his parent's back yard, taking pleasure in teaching him how to blow empty beer cans off a log with a .22 pistol. Roger Birkhead, then 10–12 years old, was a good student; the cans were pulverized.

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Historical Sightings and Recent Surveys of the Herpetofauna of the James River Park System

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The James River Park System spans a large swath of the James River at Richmond, Virginia, just northwest of where the river is navigable for merchant shipping. Though you are engulfed by a metropolis at many areas of the park, you might feel for a long while that you have arrived in a primeval wilderness. I grew up near one entrance now known as Pony Pasture. As a young person of about ten years I went with my father to collect river water for an aquarium. While my father collected the water I ventured along the bank among tall grass and exposed knee-high rocks. When I approached a head-high (for me at the time) boulder, I luckily happened to look down to see my right foot poised to step on a large coiled and perhaps sleeping northern copperhead (*Agkistrodon contortrix mokasen*). Adrenaline equipped my left leg with the energy to vault me over the snake, heart nearly jumping out of my chest. Later, in 1972, Hurricane Agnes flooded the James and sent a dinner-plate-sized painted turtle (*Chrysemys picta*) uphill and into my yard. I discovered it one morning, disoriented under my parent's residential mailbox.

By the late 1970s I ventured to the area now known as Pony Pasture and found a few individuals of what would become the icon of the park system, the spotted salamander (*Ambystoma maculatum*) in a vernal pool located near the drive-in entrance to this park's parking area. Until 1980 I continued to see a few

salamanders in this pool but by 1981 with growing commitments I didn't get to see the park early enough to view spotted salamanders. By the late 1980s, growing citizen interest and concern in the natural areas by the James River made the spotted salamander the token icon of the park. Now Riverside Drive (the road that salamanders must cross) is occasionally closed in March through early May on rainy nights when the salamanders are migrating. Still, many are killed by traffic and students from my alma mater, Virginia Commonwealth University (VCU), monitor the migration and road deaths of these tiny and yet charismatic creatures.

For a significantly wilder river view and greater potential for herpetological discoveries a short drive toward downtown Richmond, with a turn at 42nd Street, brings you to a small parking area under dense shade of towering tulip trees, red maples and sweet gums. The entrance leads you to a steep stone stairway making it difficult to explore the understory here. It is usually wet and somewhat slippery as well. But, as part of a VCU ecology class led by Dr. Charles Blem in 1986, I and about 10 students sifted through leaf litter and beneath fallen logs to find dozens of the cryptic, recalcitrant and diminutive red-backed salamanders (*Plethodon cinereus*). At that time and even into my explorations in 1987, 1988 and 1990, I saw many

salamanders, but by 1999 I could find no more than two. While various factors may influence salamander numbers, I did find one introduction in 2001 that may indirectly and negatively affect salamander densities. The introduction was an invasive herb, garlic mustard (*Alliaria petiolata*). In 2001 I found six or so garlic mustard plants on the hilltop at the entrance to the park and there was nothing barring their progress in colonizing the salamander-inhabited slope. By 2002 garlic mustard had progressed to the slopes and I picked as much as I could find. Since that time I have heard some field scientists suggest that garlic mustard may be harmful to woodland salamanders by changing soil chemistry and thus driving away their invertebrate prey. One study by Maerz and Blossey (2002) has been undertaken to quantify the negative impact of garlic mustard on the red-backed salamander.

Also during one of the field trips led by Dr. Blem, we witnessed a very complaisant northern copperhead stretched full length and basking on the railing, allowing us to pass without so much as twitching.

Late in the 1980s, the mid and then late 1990s, I made more trips to the 42nd Street entrance and explored further into the park. Once you arrive at a metal bridge that juts riverward and terminates with an observation deck that provides a fair river view; you can descend a spiral stairway which takes you to the humid and sweetly earthy-smelling ground of alluvial forest. You immediately encounter a walking trail sometimes alive with joggers, dog walkers and bicyclers. But then you turn north toward the river, leave the people behind, and scramble across sunken low-rise boulders, some open sand and mud, beneath black gum, willow oak and green ash trees. In spring 1995 I saw a single spring peeper (*Pseudacris crucifer*) at eye-level, resting on a black gum leaf. In spring of 1999 I heard the buzzing call of a Cope's gray treefrog (*Hyla chrysoscelis*) here.

Heading toward the river you soon find yourself among larger boulders, swaths of exposed wide-domed boulders with dense vegetation clinging to the interstitial spaces and occluded, fishless backwaters of the river. In one of these backwater areas in 2002, I found an algae-covered, writhing pool full of large tadpoles of *Lithobates* species reminding me of the connection that primitive peoples made between amphibians and the chthonic world mentioned in Kuzmin (1999). I found several adult southern leopard frogs (*Lithobates sphenoccephalus*) and a few adult pickerel frogs (*Lithobates palustris*) in the vicinity, placing those species as the putative parents of the tadpoles in the backwater pond. It was near this pond in a thickly vegetated margin

of a poolside boulder that I saw the tail of a snake and quickly grabbed it to pull out an eastern wormsneak (*Carphophis amoenus amoenus*), which lived up to its placid characterization mentioned by Mitchell (1994) while I took several pictures.

Continuing on toward the actual river, on a trail of sorts leading to a pawpaw covered island, I continued to search for northern copperheads, but never saw another. From the river shoreline of the pawpaw island you see the gurgling to raging river, boulders strewn everywhere. Ubiquitous great blue herons stalk unfortunate smallmouth bass, sunfish and frogs. The only sign of the bustling city on the north shore is the silent sentinel of the Carillon, a bell tower built as memorial to Virginia soldiers who fought and died in World War I.

To the south of the Carillon view are short-statured boulders, sparsely vegetated sand bars and more sun-exposed occluded backwaters, marsh and swamp. Here in almost any given spring-time you will find dozens of toadlets ranging in color from greenish brown to almost black of the American toad (*Anaxyrus americana*); although these toadlets were common I've never happened upon an adult. No doubt adults are there and their apparent scarcity, at least near the river, may derive either from successful or attempted predation by those persistent great blue herons. Here I found the bullfrog (*Lithobates catesbeianus*). This usually common species, maybe due to the perseverance of the herons, was hiding in tree-screened pools. This frog probably also breeds in the same pools as the southern leopard frog and pickerel frog. In 2000 I saw a solid green bullfrog clearly eight inches long from its snout to its pubis-ischium. No doubt, this frog attained such a size as a predator of the smaller leopard and pickerel frogs.

While the James River Park System remains popular these and potentially many more herps have a dynamic mosaic of habitats in which to breed and live out their lives. Threats to the park are many. For example, in 2011 a Richmond City Council member proposed some legislation that would slash funding for the park system. I, along with possibly thousands of fellow Richmond residents emailed the councilman to such an extent that the legislation was dropped. On the other hand hurricanes don't respond to petitions and just as Agnes displaced the painted turtle in 1972, Isabel in 2003 scoured the back channel where the southern leopard and pickerel frogs were breeding the previous year. But hurricanes, unlike council legislation, can create as well as destroy. No doubt the pickerel, southern leopard and bull frogs found equally suitable post-Isabel breeding sites.

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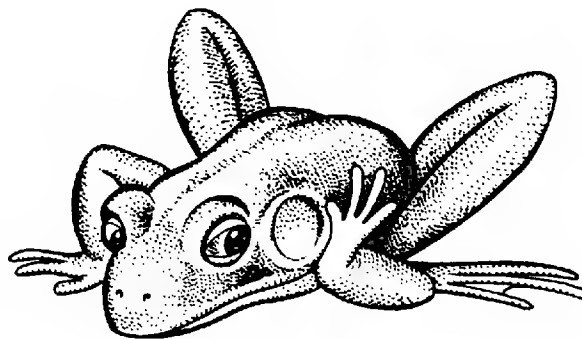
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The Tympanum

Dear CHS Members and Grants Committee,

I'm writing to report on the 2010 research season for our wood turtle study in Cheshire County, New Hampshire. I apologize for the late reporting.

The year 2010 was an exciting one for wood turtle study in Cheshire County. We found 8 males and 2 females and nearly half of the wood turtles found were aged over 40 years. This was nearly the opposite ratio of the 2009 research season when most were females and under the age of 25. In fact, two males at Site No. 5 appear to be approximately 70 years old! (see below).



Demographics

For the season, we identified a total of 10 turtles through visual surveys. Six turtles were found at our initial site in Swanzy (Site No. 4), 2 new turtles were found at our second site in Richmond (Site No. 2), and 2 were found at a new site in Surry (Site No.

5). In total, males outnumbered the females: 8 males to 2 females.

We estimated age by counting rings on the plastron for turtles less than 25 years old. For turtles clearly older than 25, we estimated the age by judging the wear on the plastron using methods developed by Jones (2009). Male ages ranged from 13 to 70+; the two females were aged 6 and 8. Weights ranged from 186 g to 1026 g (average weight of all individuals was 698 g).



Turtles #26 (above) and #27 (below) were estimated to be about 70 years old.

We tracked 12 wood turtles in total for the year. Six were new finds and six were 2009 turtles that kept the transmitters through the winter. Three new transmitters fell off in late summer 2010 due to a paint issue on the transmitters (stock was subsequently repainted by the manufacturer at no charge). Two transmitters were recovered in the fall of 2010 and the turtles released unharmed. The six remaining wood turtles were tracked through the winter (2010–2011) and found to hibernate in the same areas where they spent the spring and summer. One transmitter signal was never picked up in 2011 although I checked the surrounding area every 2 months starting in March 2011. I suspect transmitter failure although it is impossible to verify without finding the turtle. All other transmitters were recovered in the spring of 2011 and the wood turtles released unharmed.



Plastron of turtle #23, the youngest wood turtle found in 2010..

Habitat Use

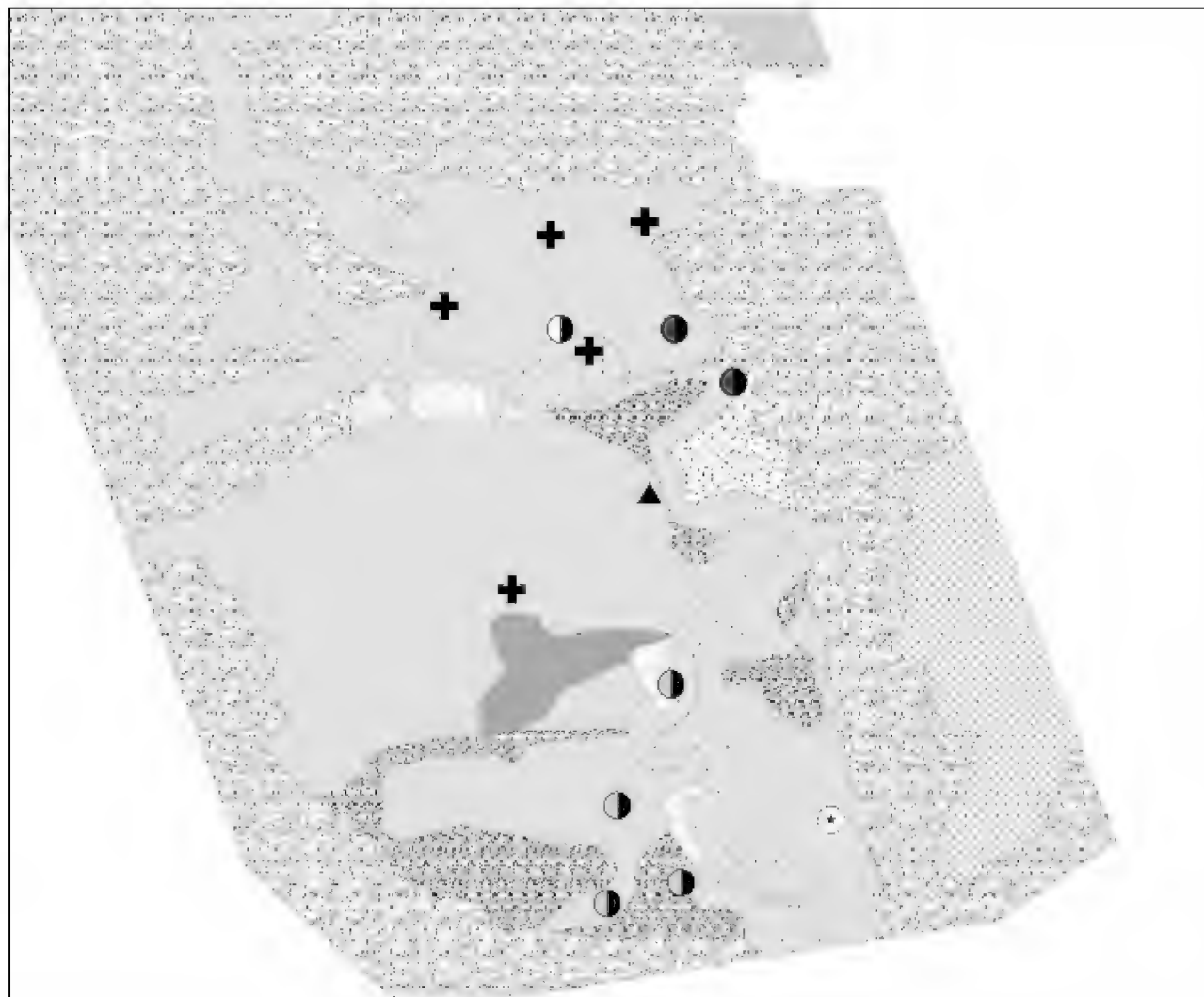
Of the ten turtles found in 2010, six turtles were tracked for radio-telemetry at Site No. 4 (3), Site No. 2 (1) and Site No. 5 (2). In addition, six turtles were continuously tracked in Richmond (5) and Site No. 4 (1), totaling 12 turtles tracked in 2010.

Habitat vegetation was delineated at Site No. 2 by Antioch University New England (AUNE) graduate student Mirka Zapletal. In 2010, most of the meadow areas were dry whereas in 2009, many areas remained wet through much of the summer season. As can be seen in the accompanying map, wood turtles were often found in the meadow areas.

An ongoing concern is that wood turtles are often found as much as 300 m away from water but state regulations do not protect small streams such as the one at Site No. 4, which is productive wood turtle habitat.

Turtles were tracked by AUNE graduate students at random times per week at varying times of day for the season and GPS points were taken each time a turtle was located. The resulting GPS points for Site 2 are shown on the map.

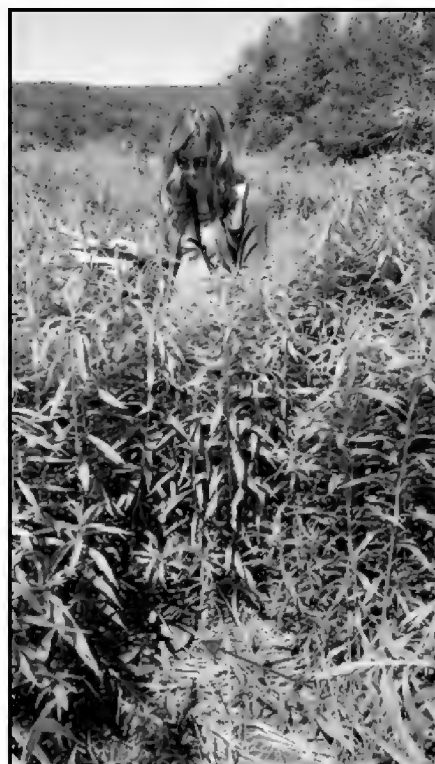
We attempted to identify wood turtle nesting areas in 2010 and looked for nests and potential nesting sites. We discovered one



nest site and broken egg pieces at Site No. 2. After walking the length of the creek, we identified four similar sandy areas as potential nesting areas. At Site No. 5, we concentrated in an area where a turtle (unidentified) was seen nesting in previous years. Wildlife cameras were set up at sites 2 and 5, and monitored regularly throughout June and July.

We did not find any evidence of nesting but we did find that wild turkeys were frequently using the sandy areas we identified for dust baths. Raccoons, skunks and deer were caught on several cameras. Raccoons and skunks are known to be nest predators so their presence is noteworthy, but on camera none appeared to disturb the potential nesting sites and we did not find any other disturbed nests.

The turtles that were radio-tracked in 2009 and 2010 represent a significant effort in researching wood turtle populations in Cheshire County, New Hampshire, for the first time.



Turtle #26, tracked in high grasses by AUNE graduate student Angie Michael.

Thank you very much for your support of my research. Your support was critical to this work and reports are being sent to the conservation commissions of Surry, Swanzey, and Richmond, New Hampshire.

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Answers to Herp-Acrostic #21

The quotation was taken from page 83 of *Song of the Snake* by [Eric] Worrell:

“How long does it take to die from the bite of a taipan or a tiger snake? It’s a common question, but not a good one, as there is no answer. There are also no answers to a million other questions about snake-bite.”

- | | |
|---------------------|-------------------|
| A. White’s | L. Onion |
| B. O’Shea | M. Florist |
| C. Rainbow | N. Tent tortoises |
| D. Round Island boa | O. Hooknose |
| E. Epithet | P. Endemic |
| F. Leaf | Q. Squeakers |
| G. Litter | R. Moose |
| H. Southeast Asia | S. Abbott |
| I. Ottoman | T. Kangaroo rat |
| J. Nominate | U. Equine |
| K. Graeme Gow | |

Herpetology 2012

In this column the editorial staff presents short abstracts of herpetological articles we have found of interest. This is not an attempt to summarize all of the research papers being published; it is an attempt to increase the reader's awareness of what herpetologists have been doing and publishing. The editor assumes full responsibility for any errors or misleading statements.

EXPLOITATION OF REPTILES IN INDONESIA

V. Nijman et al. [2012, The Herpetological Journal 22(2):83-89] report on the commercial trade in three reptile species harvested for different purposes in western Indonesia (Kalimantan, Java, Sumatra) for international markets: (1) Tokay geckos, *Gekko gecko*, traded for medicinal uses, (2) Javan filesnakes, *Acrochordus javanicus*, harvested for skins, and (3) Asiatic softshell turtles, *Amyda cartilaginea*, harvested for meat; each species is also exploited for the pet trade, but to a lesser extent. All three species are harvested from wild populations. None of the species are protected by Indonesian law, but there is a national harvest and export quota system in place to prevent overexploitation. For each species, the authors collected data from catchers, middlemen and exporters on harvest volumes, catching locales, turnover and prices, and compared these figures with the quota allocated by the Indonesian authorities. The trade in *G. gecko* from Central and East Java (3 traders, 2006) amounts to around 1.2 million individuals annually, greatly exceeding the national quota of 50,000 *G. gecko* for the entire year and representing a monetary value for exporters of around one million US\$ / year. The annual trade in *A. javanicus* (in five cities in East and South Kalimantan, and North Sumatra, Riau (central Sumatra) and South Sumatra, 2005-6) was estimated at around 300,000 individuals from Kalimantan and 30,000 from Sumatra, exceeding the national quota of 200,000 individuals / year and representing a monetary value for exporters of at least three million US\$ / year. The trade in *A. cartilaginea* was monitored in three cities in North Sumatra and Riau in 1999: 200,000–450,000 individuals were traded in 1998 and 1999, greatly exceeding the national quota of 10,000, with a monetary value for exporters in excess of ten million US\$ / year. The authors conclude that implementation of wildlife trade regulations by and large are not abided by many reptile traders and are not sufficiently enforced by the Indonesian authorities, and further note that the quota-setting process rarely involves non-detriment findings based on reliable biological information. In order for reptile trade to be sustainable in Indonesia, it is paramount that non-detriment findings are undertaken and existing regulations are sufficiently enforced.

PIPE REFUGES IN THE NEOTROPICS

E. Ferreira et al. [2012, The Herpetological Journal 22(1):59-62] evaluated the usefulness of arboreal pipe refuges for studying Neotropical herpetofauna, by quantifying the effects of micro-habitat variables and pipe coloration on pipe occupancy rates. The study was conducted in two areas of Brazil, within the Amazonia/Cerrado ecotone. The authors used 55 sets of refuges that each comprised three pipes with different colors (white, gray and black). They recorded 122 occupancy events by four hylid and one scincid species. Refuge color did not significantly affect occupancy rates. Environmental data explained a significant portion (10.6%) of the total variance of occupancy, with vegetation type and height of opening being most important.

JAMAICA BAY DIAMOND-BACKED TERRAPINS

K. A. Muldoon and R. L. Burke [2012, Canadian J. Zoology 90(5):651-652] note that as with other turtles, the postemergent movements, overwintering behaviors, and survivorship of hatchling diamond-backed terrapins (*Malaclemys terrapin*) are poorly known, but anecdotal reports suggest that they may spend more time on land than most aquatic turtles. The authors investigated this behavior using drift fences with pitfall traps on the island of Ruler's Bar, Jamaica Bay, New York, fall 2006 to spring 2008. They captured 324 live hatchling terrapins (95 recaptured at least once) and found 43 dead. After emergence from nests in the fall, most hatchlings moved upland away from the water; this pattern was reversed in the spring. Hatchling body sizes shrank during winter, probably owing to desiccation, and hatchlings were more likely to move on warmer days and days without precipitation. Some hatchlings were recaptured on land as long as 9 months after emergence. As a result, hatchling *M. terrapin* were seen on land from April to December, well outside fall and spring during which they emerge from nests, and there was strong evidence that hatchling *M. terrapin* overwinter on land outside their nests. One important nest predator (raccoons, *Procyon lotor*) was also an important hatchling predator, as were Norway rats (*Rattus norvegicus*). Future work should investigate the terrestrial microhabitats used by hatchling *M. terrapin*, and management should protect hatchlings during this life stage.

SNAPPING TURTLE HABITAT SELECTION

J. E. Paterson et al. [2012, Canadian J. Zoology 90(2):139-149] note that habitat selection is the disproportionate use of habitat compared with availability. Many studies have focused on specialists, but few have considered habitat selection in populations that are generalists, which can be composed of generalist individuals or individuals that specialize on different habitats. The authors tested habitat selection and individual specialization in a northern population of a supposed generalist, the snapping turtle (*Chelydra serpentina*), during the active season and winter using telemetry. Habitat selection was tested at two spatial scales by comparing random points to home ranges and turtle locations using Euclidean distances. Turtles selected home ranges from the habitats available in the population range. However, at the population level, all aquatic habitats were equally preferred, and the population behaved as a generalist owing to individuals specialized on different habitats. Over half of the individuals showed evidence of individual specialization on different habitat types. Turtles did not select habitat within home ranges during the active season, but overwintering turtles chose locations that were colder than haphazard stations in the same habitats, likely to reduce metabolic costs and the risk of acidosis. These findings have implications for the management of this species at risk and for understanding the evolution of resource generalization.

PYXIE FROG CONSERVATION

C. A. Yetman et al. [2012, The Herpetological Journal 22(1): 23-32] report that until now nothing has been known about the age of wild giant bullfrogs (*Pyxicephalus adspersus*); yet this information has important conservation implications for this regionally threatened species. The authors quantified and compared the age, body size and body condition of adult male and female *P. adspersus* caught during spawning events at peri-urban breeding sites in Diepsloot and at Glen Austin and Bullfrog pans in Gauteng Province, South Africa. Age was estimated from lines of arrested growth (LAG) counted in cross-sections of phalanges. Males and females from all three sites possessed 6 ± 2 (max. 16) and 4 ± 1 (max. 11) LAG, respectively, suggesting shorter female longevity. Individuals with <3 LAG were not found at the breeding sites, implying that newly metamorphosed *P. adspersus* require at least three years to reach sexual maturity. There was no significant difference in the LAG counts of same-sex animals between the three sites. However, mean male snout-vent length, mass, and body condition was greatest at Glen Austin Pan, and lowest at Bullfrog Pan. The latter is possibly explained by chemical contamination of Bullfrog Pan from an adjacent disused landfill. At Glen Austin Pan males and females sampled in 2004–2006 for this study were significantly shorter than those sampled at the same site in 1992–1993 for a different study. Results of this study suggest that male *P. adspersus* may live for 20 years or more in the wild, but at some peri-urban breeding sites adult life expectancy is declining. Juvenile *P. adspersus* are most threatened by terrestrial habitat transformation because they take ~3 years to mature, during which period they may move great distances from their natal site. Differences in the size and condition of *P. adspersus* between the study sites suggests that the species requires site-specific management in addition to conservation at larger spatial scales.

RATSLAKE MORTALITY PATTERNS

P. J. Weatherhead et al. [2012, J. Herpetology 46(1):100-103] notes that a recent study of ratsnakes (*Elaphe obsoleta*) in Texas found that adult mortality was higher for females than males, consistent with the cost of reproduction in snakes being higher for females. To determine whether the same pattern prevailed in a northern population of ratsnakes, the author used radio-telemetry data to test several predictions of the cost-of-reproduction hypothesis. Contrary to there being a cost to reproduction, mortality rates did not differ between juvenile and adult snakes and, contrary to females having a higher cost of reproduction, mortality rates among adults did not differ between males and females. The only evidence consistent with reproduction increasing mortality risk was higher winter mortality for females in poor condition following egg laying. Mortality did not vary with activity but increased with time spent basking, although group differences in basking were not sufficient to produce differences in mortality. High risk of winter mortality in this population may require all ratsnakes to behave in ways that mask mortality costs associated with reproduction. To determine whether these results for ratsnakes in Ontario are anomalous or reflect something more substantial about the cost of reproduction in snakes, details of mortality patterns from more species, ideally with diverse ecologies, are needed.

ALPINE NEWT MOVEMENTS AMONG DRYING RUTS

O. Kopecký et al. [2012, Herpetozoa 24(3/4):127-134] note that in unpredictable habitats, it is advantageous to amphibians to reduce the risk of weather-induced offspring mortality by utilization of several reproductive patches. In European deciduous forest landscapes, ruts caused by vehicular traffic, typically comprising small vernal or ephemeral pools with variable hydroperiod, are at times used as breeding habitats by some species of amphibians. Previous research shows that in such systems newts move among ruts within a single reproductive season. The aim was to characterize such movements by means of a capture-mark-recapture study of the alpine newt, *Mesotriton alpestris*, during two years differing in water availability, and to detect possible sex-specific differences. Movement among ruts differed between years according to sex. In the year with higher pool drying frequency, more females changed ruts than in the year when stable conditions prevailed. Among the adults that changed ruts, however, the mean number of aquatic patches visited was higher in males. These results show that the sexes can react differently to environmental correlates and that alpine newts are well adapted to utilize networks of temporary pools.

ECOLOGY OF A BRAZILIAN CAECILIAN

A. O. Maciel et al. [2012, J. Herpetology 46(1):47-50] note that basic ecological information is lacking for most caecilian populations, especially those of the Neotropical region where only few and nonquantitative ecological data were obtained for a small number of species. The Neotropical genus *Caecilia* is the most diverse of Gymnophiona with 33 species, for which natural history information is restricted to the description of clutch size for just one species. The authors provide natural history data based on 61 specimens of *Caecilia gracilis* found in a riparian forest in Cerrado biome in northeastern Brazil. No sexual dimorphism was found in morphometric and meristic data analyzed, probably because of functional constraints related to subterranean life. No specimens were found in the dry season, but in the wet season they were found at soil depth ranging from 5 to 31.5 cm, suggesting that seasonal vertical migration in *C. gracilis* occurs. In terms of both frequency and number, earthworms were the most important prey items encountered, thus suggesting a specialized diet in *C. gracilis*. Trematoda and Nematoda parasites were found in low numbers and at low prevalence.

FORENSIC SNAKESKIN IDENTIFICATION

B. W. Baker et al. [2012, The Herpetological Journal 22(2):79-82] demonstrate that near-infrared (NIR) imaging with an alternate light source (ALS) and digital photography are useful tools for revealing and documenting original dorsal skin patterns found on dyed snake leather products. They used an ALS at NIR wavelengths to reveal dorsal patterns on a tanned and dyed reticulated python skin (*Python reticulatus*) submitted for forensic analysis. Under NIR imaging, this pattern was easily photographed using a digital camera designed specifically for forensic ultraviolet (UV) and infrared (IR) photography. These methods have great potential for species identification based on highly modified animal products (such as dyed snake leather), thus contributing to CITES enforcement efforts.

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UPCOMING MEETINGS

The next meeting of the Chicago Herpetological Society will be held at 7:30 P.M., Wednesday, April 25, at the Peggy Notebaert Nature Museum, Cannon Drive and Fullerton Parkway, in Chicago. **Tony Gamble**, a postdoctoral researcher at the University of Minnesota, will speak to us about “Ancient Lands and Sticky Hands: Gecko Biogeography and Evolution.” Tony has just received a 3-year grant from the National Science Foundation to examine the evolution of sex determining mechanisms in geckos, a project that builds upon his dissertation research. Tony has conducted herpetological field work throughout the United States and Puerto Rico as well as Brazil, Peru, Mexico, Australia, Namibia, and South Africa.

Special weekend meeting, Saturday, June 16, 3:00 P.M., at the Kent Fuller Air Station Prairie/Tyner Center, 2400 Compass Road, Glenview. To learn more about the Tyner Center, visit their website: <http://glenviewparks.org/index.php/facilities-parks/kent-fuller-air-station-prairietyner-center>. This will be the perfect opportunity to attend a CHS meeting for those of you who have trouble making it on Wednesday evenings. Come a few hours early and explore the prairie. You’re welcome to bring a cold picnic lunch, but no grilling will be possible, and all trash must go home with us. At this meeting **Chip Cochran** will share his research on venom variation in the speckled rattlesnake and show how a CHS grant has helped further his research. Chip graduated from the University of Arizona with a degree in Ecology and Evolutionary Biology. He is currently a graduate student at Loma Linda University, “studying intraspecific venom variation in order to continue my quest to travel the world while bothering various venomous snakes.”

The June 27 meeting will be our popular and always well-attended annual **Show & Tell** meeting. Bring an animal that you find interesting for one reason or another and be prepared to give a short (under five minutes) presentation to the group. Don't be shy. Neither age (yours) nor commonness (the animal's) should be a limitation.

The regular monthly meetings of the Chicago Herpetological Society take place at Chicago's newest museum—the **Peggy Notebaert Nature Museum**. This beautiful building is at Fullerton Parkway and Cannon Drive, directly across Fullerton from the Lincoln Park Zoo. Meetings are held the last Wednesday of each month, from 7:30 P.M. through 9:30 P.M. Parking is free on Cannon Drive. A plethora of CTA buses stop nearby.

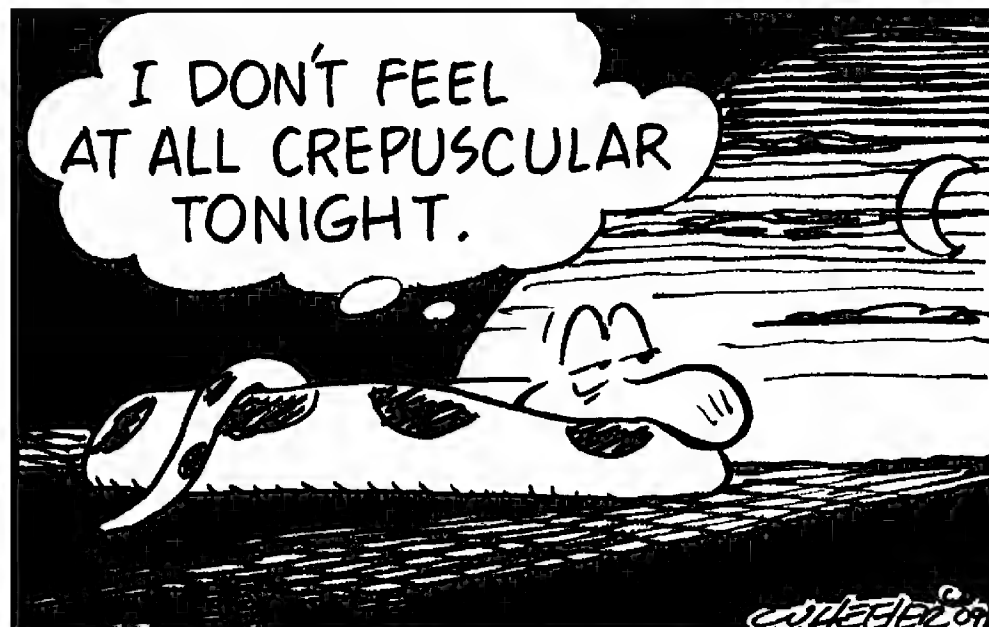
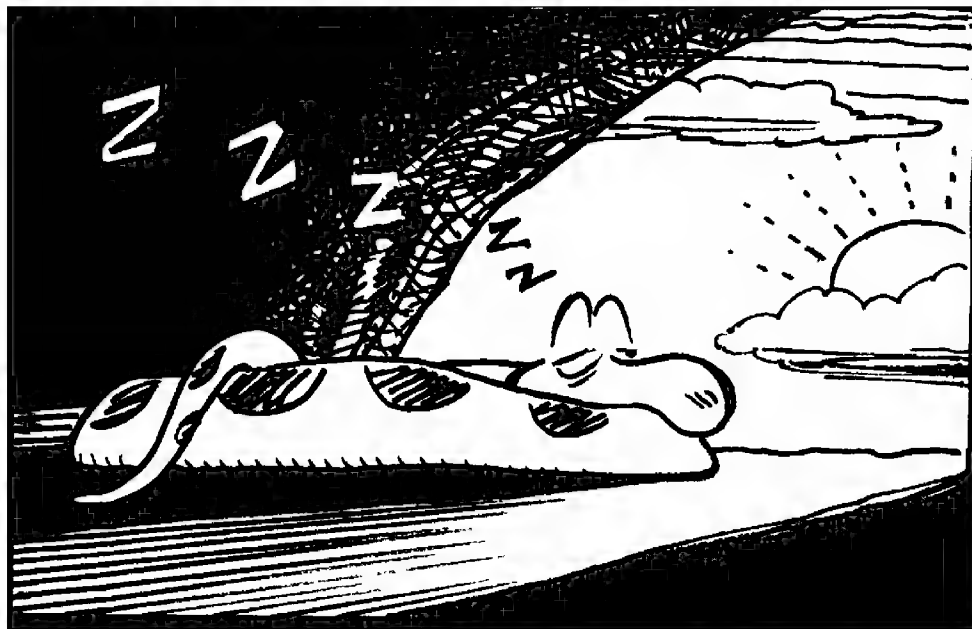
Board of Directors Meeting

Are you interested in how the decisions are made that determine how the Chicago Herpetological Society runs? And would you like to have input into those decisions? If so, mark your calendar for the next board meeting, to be held at 7:30 P.M., June 15, in the adult meeting room on the second floor of the Schaumburg Township District Library, 130 S. Roselle Road, Schaumburg.

The Chicago Turtle Club

The monthly meetings of the Chicago Turtle Club are informal; questions, children and animals are welcome. Meetings normally take place at the North Park Village Nature Center, 5801 N. Pulaski, in Chicago. Parking is free. For more info visit the group's Facebook page.

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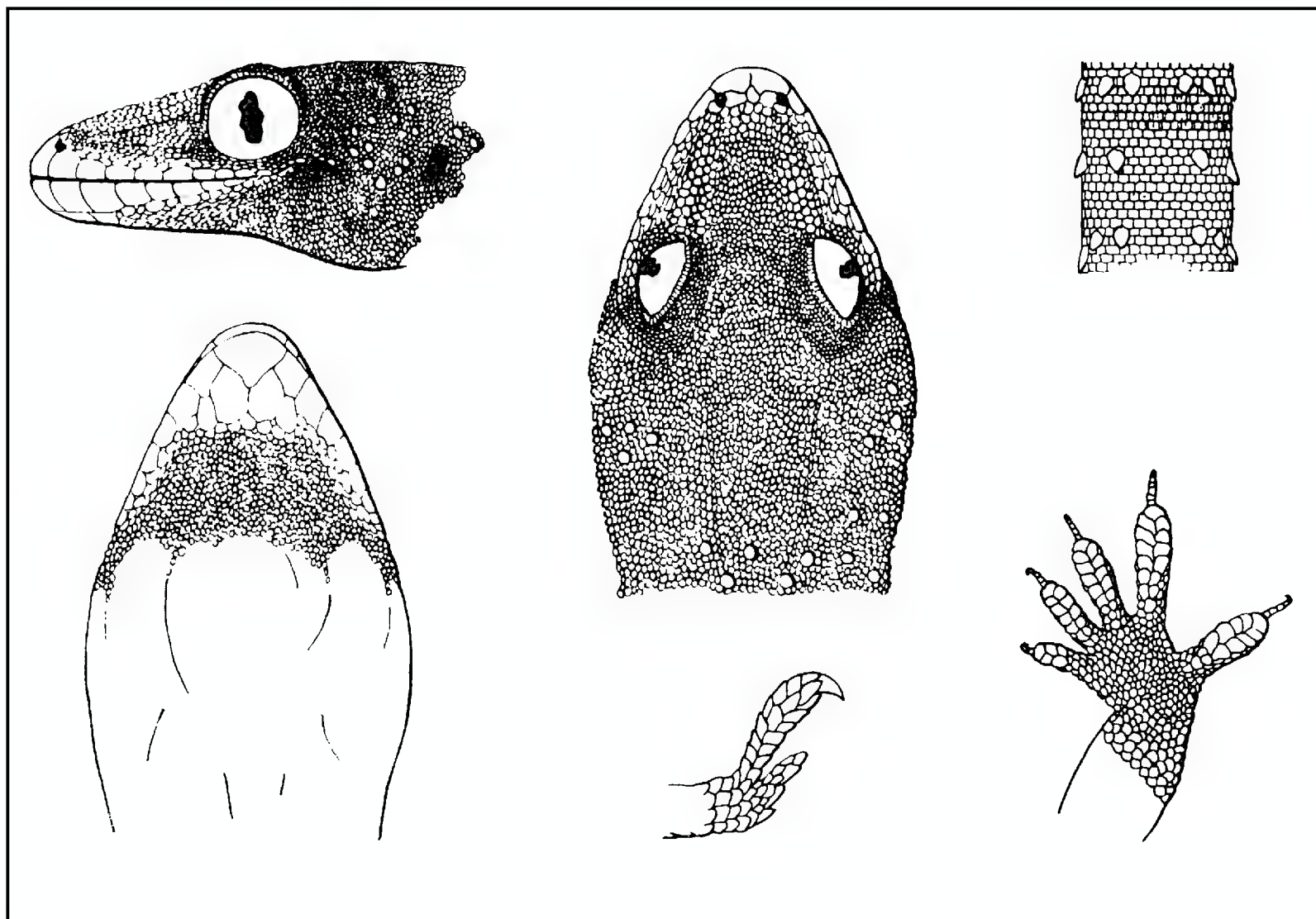
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A Discussion of Two Methods of Modeling Suitable Climate for the Burmese Python, <i>Python bivittatus</i> , with Comments on Rodda, Jarnevich and Reed (2011)	David G. Barker and Tracy M. Barker	69
What You Missed at the May Meeting	John Archer	77
Unofficial Minutes of the CHS Board Meeting, May 18, 2012		79
Advertisements		80

Cover: House gecko, *Hemidactylus mabouia*. Drawings from *The Herpetology of Porto Rico* by Leonhard Stejneger, Annual Report of the United States National Museum for 1902 (issued in 1904).

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Membership in the CHS includes a subscription to the monthly *Bulletin*. Annual dues are: Individual Membership, \$25.00; Family Membership, \$28.00; Sustaining Membership, \$50.00; Contributing Membership, \$100.00; Institutional Membership, \$38.00. Remittance must be made in U.S. funds. Subscribers outside the U.S. must add \$12.00 for postage. Send membership dues or address changes to: Chicago Herpetological Society, Membership Secretary, 2430 N. Cannon Drive, Chicago, IL 60614.

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A Discussion of Two Methods of Modeling Suitable Climate for the Burmese Python, *Python bivittatus*, with Comments on Rodda, Jarnevich and Reed (2011)

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Overview

In late February 2008, the online version of a paper by Gordon H. Rodda, Catherine S. Jarnevich and Robert N. Reed was posted on the *Biological Invasions* website. This paper predicted that suitable climate for Burmese pythons [then *Python molurus bivittatus*] existed in a wide swath across the southern third of the continental USA. It was accompanied by a USGS press release that implied that *bivittatus* could and would likely rapidly spread from its established population in the Everglades region of extreme southern Florida into this region of suitable climate. This paper was published in print in *Biological Invasions* in 2009; references to this one paper are cited as either Rodda et al. (2008) or Rodda et al. (2009).

The USGS press release incited a glut of articles and interviews in which the actual conclusions of the paper were grossly misinterpreted by the media, the authors, and just about anyone willing to state that this country would soon be overrun by pythons. As examples, in the 21 February 2008 edition of the *San Francisco Chronicle*, Skip Snow of the National Park Service was quoted as saying that already one python crawled 100 miles north to the shore of Lake Okeechobee. Gordon Rodda stated: “At 20 miles a month, a determined Burmese python from Florida could arrive in San Francisco as early as August 2020. It would be exceptional for one animal to be that unidirectional in its movement, but it’s mathematically possible,” Rodda said. “The snake’s cross-country crawl would be made easier by the large population of beavers along the way,” Rodda said. “. . . No beaver would be safe from a python.” On 22 February 2008, the story was on the front page of *USA Today*. Also on 22 February 2008, the *Atlantic Journal* quoted Robert Reed stating that when pythons made it to Georgia “They will chow down on pigs. They will chow down on turkeys.”

In August 2008, a paper by R. Alexander Pyron, Frank T. Burbrink and Timothy J. Guiher appeared in the online journal *PLoS ONE*. The authors created what they termed an “ecological niche model” for Burmese pythons. As shown in Figure 1, when this model was applied to the USA, its predictions of suitable space were far more conservative than those of Rodda et al. (2008) seen in Figure 2. The paper also included a critical analysis of the data and methods of analysis used by Rodda et al. (2008).

Important to this timeline, a paper published in 2009 argued that the Burmese python is properly classified as a species, *Python bivittatus* (Jacobs et al., 2009). This change has been largely rejected by researchers associated with agencies of the Department of the Interior, but has been accepted and used by most authors (for examples see Barker and Barker, 2010a, b, c; Cota, 2010; Engeman et al., 2011; Krysko et al., 2011).

In February 2011, Rodda, Jarnevich and Reed published another article on the topic of suitable climate space for Burmese pythons. This paper attempts to explain why their method of predicting suitable climate space is both technically and

fundamentally a better way to do climate matching than the method employed by Pyron et al. (2008), and includes a critical review of that analysis. Rodda et al. (2011) admit that there is controversy in the “scientific community” over the optimal method to do climate matching, and discuss some of the reasons underlying the controversy.

Climate space models

In the climate matching studies done for *molurus/bivittatus*, Rodda et al. (2008) and Pyron et al. (2008) use locality information based on the native ranges of the two taxa, combined with climatic data from those areas to generate models describing the suitable climate space for these taxa. These climate space models can be “fitted” to extralimital geographic areas to identify areas exhibiting the same or similar climate space.

For example, the climate space derived for *molurus/bivittatus* by Rodda et al. (2008) is based on 149 locality points, and data for the mean monthly precipitation and the mean monthly temperature at each of these points comprise the data set. These variables from 149 locality points are analyzed to create a climate space model. This defined climate space is then “fitted” to areas with similar climate, with those areas then identified as suitable extralimital climate for the potential invasive species.

To define the climate space of *molurus/bivittatus*, Rodda et al. (2008) selected locality points from around the periphery of the ranges of *molurus* and *bivittatus*. [Curiously, it is stated that the data from two additional localities were added to the original data set of 149 reporting stations—this undoubtedly has some significance, but those new localities are not identified, and any analyses made beyond that in Rodda et al. (2008) and Reed and Rodda (2009) are not illustrated or discussed.] According to the authors, the actual presence or absence of pythons at the locality points is not considered to be important; however, Pyron et al. (2008) criticizes this as a serious fault of the analysis of Rodda et al. (2008). It is a fact that a significant number of the locality points selected by Rodda et al. (2008) are well outside both geographical and elevational ranges of both *molurus* and *bivittatus*. [See Barker and Barker (2010c) for details.]

Pyron et al. (2008) took a different tack and used 90 locality points that were based on the localities and elevations of actual python specimens, referred to as “presence localities.” The climate data utilized in this analysis were taken from the BioClim data set. The locality points and climate data were analyzed using MaxEnt, a software program that implements a statistical algorithm for maximum entropy modeling. MaxEnt was used by Pyron et al. (2008) to generate the map of potential suitable climate for the *molurus/bivittatus* combination in the continental USA.

The program MaxEnt allows for a greater number of variables to be used in the analysis of native climate space than the method used in Rodda et al. (2008), and the variables can be weighted for importance. Pyron et al. (2008) described this as

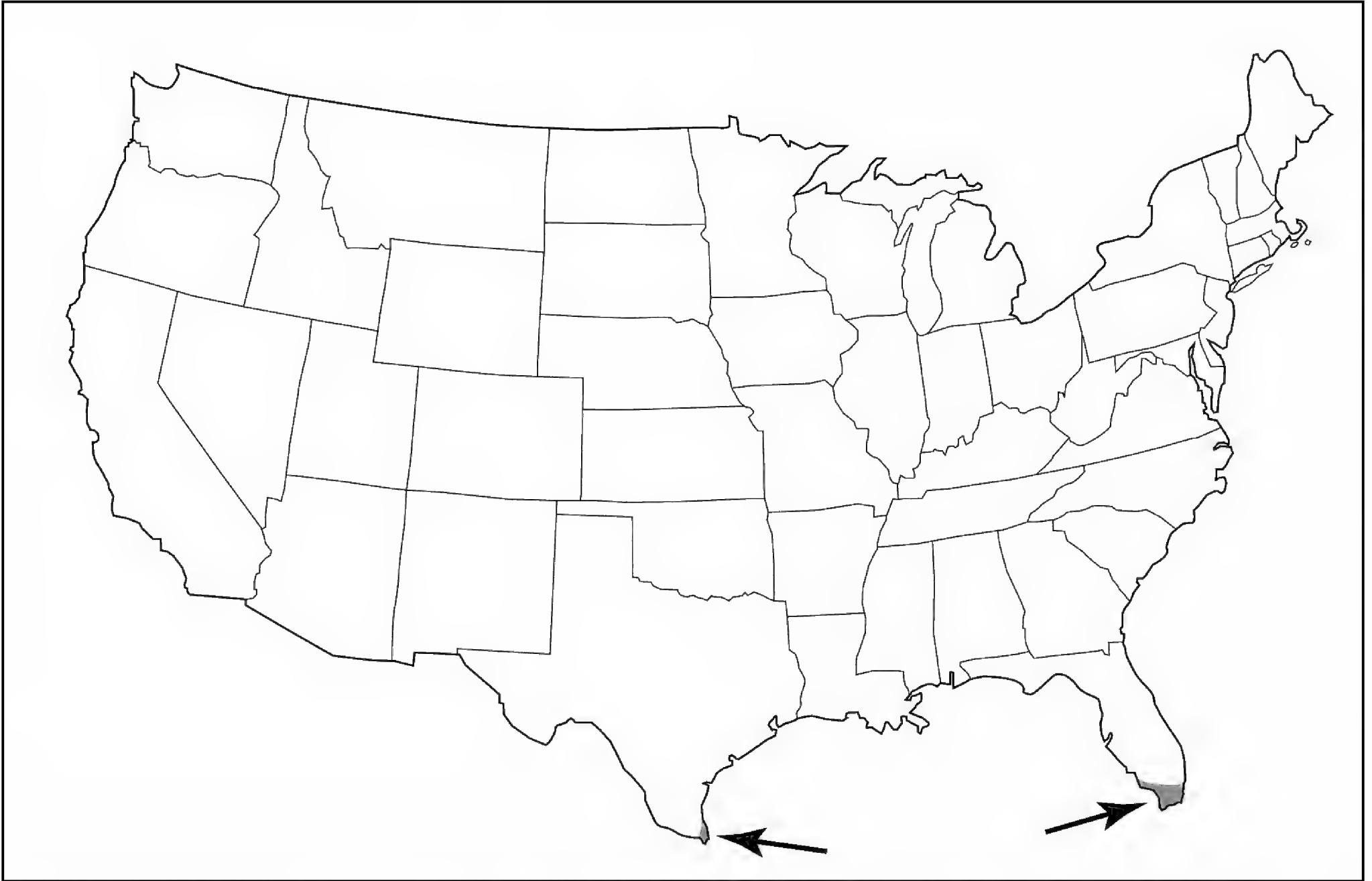


Figure 1. The two small gray-shaded areas represent the areas of suitable climate in the continental USA as predicted by Pyron et al. (2008).



Figure 2. The gray-shaded areas represent the areas of suitable climate in the continental USA as predicted by Rodda et al. (2008).

“ecological niche modeling” versus the climate space modeling of Rodda et al. (2008). However, Rodda et al. (2011) dispute this, saying that the space that MaxEnt identifies is not a niche space and then refer to it in the remainder of the paper as climate space. The map of suitable climate space in the continental USA generated by Pyron et al. (2008) is far more conservative than that of Rodda et al. (2008).

Rodda et al. (2011) emphasize one issue that they consider to be key when analyzing climate space. They discuss that there are two types of climate space, which they identify as “fundamental climate space” and “realized climate space.”

The **fundamental climate space** of a species is the climate space in which a species could survive without regard to the other biotic and abiotic factors that limit the species in its native range. Interestingly, they cite Darwin’s comments on how some plants from tropical regions do surprisingly well in the climate of England, even though they are not found anywhere in nature in a similar climate. Rodda et al. (2011) claim that the method they used in 2008 was intended to identify the fundamental climate space of *molorus/bivittatus*.

The **realized climate space** of a species is the climate space that is defined by the native range of the species. According to Rodda et al. (2011), realized climate space does not indicate the potentially much greater tolerance of a species to wider variation in the variables that are used to define the climate space. Rodda et al. (2011) define the analysis of Pyron et al. (2008) as having generated a map of the realized climate space. The realized climate space is always smaller than the fundamental climate space, as illustrated in Figure 3 of Rodda et al. (2011), and also as illustrated by the differences in the analyses of suitable climate space by Rodda et al. (2008) and Pyron et al. (2008).

An important point that has been missing from many arguments and discussions [particularly in the media] regarding the map of suitable climate for Burmese pythons in the continental USA published by Rodda et al. (2008) is that suitable climate is *not* the same thing as suitable habitat or potential range. While sunny Chattanooga, Tennessee, and beautiful Oklahoma City, Oklahoma, are predicted to be within the “suitable climate space” for *bivittatus* by Rodda et al. (2008) [highly unlikely], those predictions make absolutely no evaluation of the actual possibility that pythons could or would survive there when other biotic and abiotic factors that comprise the ecosystem and environment are considered. A map of suitable climate space *only* illustrates the area where one of a nearly infinite number of biotic and abiotic factors *may* be suitable for the survival and establishment of Burmese pythons. In the case of the analysis of the “fundamental climate space” for *molorus/bivittatus* defined by Rodda et al. (2008), an unknown amount of the area of fundamental climate space may not even actually have suitable climate. Rodda, Jarnevich, Reed, and a small group of colleagues eventually became known as the Giant Python Risk Analysis Partnership [GCRAP]. They did nothing to correct the false interpretation spread in the media that the map of Rodda et al. (2008) was a map showing where the python species could and would invade. In fact, evidenced by their statements as quoted by the media, they appeared to do much to encourage misinterpretation of that paper.

Rodda et al. (2011) describe how selecting the correct locality points and variables to use in the analysis is paramount to the process. They state that “overfitting” is a serious problem that is commonly encountered in MaxEnt analyses, and that this was committed by Pyron et al. (2008). The data set of Pyron et al. (2008) used a smaller number of locality points and incorporated 19 variables into the analysis.

Overfitting is a modeling error that occurs when the climate space model is too closely fit to a limited set of data points. Rodda et al. (2011) consider the data points chosen by Pyron et al. (2008) that were based on localities of museum specimens or published locations from within the native range to be an example of overfitting. They maintain that the resulting model—based on a conservative realized climate space—underpredicted the suitable climate space when applied to new geographic localities.

Rodda et al. (2011) also warn against “data dredging,” that being the inappropriate selection of data points and variables from a large pool of possible variables; this practice can uncover misleading relationships in data. MaxEnt makes choosing and changing variables simple; researchers using MaxEnt can easily modify the variables in their analyses and create multiple climate space models until accidentally a model is generated that closely fits the native range. The possibility then exists that the resulting best climate model is the result of random variables that actually do not best describe the native climate space.

Rodda et al. (2011) state that Pyron et al. (2008) dredged to get their model. On the other hand, Rodda et al. (2011) state that they avoided the possible trap of data dredging by considering only models that were based on a priori assumptions. They then state that their choices of the locality points that comprise their data set are based on four variables, their a priori assumptions: mean monthly temperature, mean monthly precipitation, duration of hibernation and duration of estivation.

Once a climate space model is generated, it is then fitted on a global map to illustrate the geographic areas where the estimated suitable climate space exists. Rodda et al. (2011) list four tools that can be used to screen out unacceptable climate matching models. They are as follows:

- **Native Range Inclusion.** After a climate space model is generated and fitted to a global map, one test of accuracy is just how closely the climate space fits to the actual native range of the species.
- **Minimum Training Presence.** MaxEnt simultaneously analyzes two data sets, a training data set and a test data set, and then by comparing the two analyses using several different metrics the model accuracy can be estimated. Minimum training presence is a value generated by MaxEnt that measures the ability of the model to discriminate the training data set from the test data set. The minimum training presence criterion is a metric of the logistic threshold that results in inclusion of all training presences [see: http://plantecology.syr.edu/fridley/bio793/R_apr12_notes.htm]. We note that Phillips, the creator of MaxEnt, does not mention minimum training presence as an important tool when determining the accuracy of a model in an online MaxEnt Tutorial.

- **Overfitting.** Statistically there is danger to the accuracy of a model if the data set is either too simple or too complex. However, there is no agreed upon way to determine when a data set is correctly complex. Different modelers will incorporate totally different degrees of complexity into their analyses, and it seems that ultimately the measure of a correct model is that it fits the objective of the modeler. Herein lies some of the subjectivity that plagues climate space models.

According to Wikipedia, overfitting may occur when a model is excessively complex, such as having too many parameters relative to the number of observations. A model which has been overfitted will generally have poor predictive performance, as it can exaggerate minor fluctuations in the data. Overfitting is basically using more parameters (or less data) than necessary to create a model. Rodda et al. (2011) criticize the MaxEnt analysis of Pyron et al. (2008) as being overfitted, stating that by too tightly describing the climate space in the native range of *molurus/bivittatus*, the consequence was an overconservative climate space model that underpredicted the suitable climate space in the continental USA.

- **Eco-plausibility Test.** This is a test of the climate model when fitted on the global map. If a model predicts that there is suitable climate for *molurus/bivittatus* in Alaska, the Aleutian Islands, the Sahara desert, or Oklahoma City, even if this model closely approximates the native ranges of these taxa, it does not pass the eco-plausibility test.

When a climate space model is generated and then is judged to have failed the eco-plausibility test when fitted to the global map, the modeler then changes the locality points and/or the variables and then creates another model. This can continue until a model is created that fits the objectives of the modeler and adequately satisfies these four tests. This is the most basic fault and flaw of climate modeling; there are no standard protocols to carry it out (Engeman et al., 2011). It looks very scientific while being subjective and often not repeatable, testable or provable.

The validity of the climate space model of Rodda et al. (2008)

Rodda et al. (2011) do not answer the criticisms that have been leveled at the analysis of Rodda et al. (2008) responsible for the climate space model predicting that the climate of the southern third of the continental USA was suitable for *molurus/bivittatus*. We make the following points:

1. It remains that the analysis of Rodda et al. (2008) incorrectly included the native range of *Python molurus*. It is only *Python bivittatus* that is established in south Florida. It makes no difference that Rodda and most of the GCRAP camp continue to consider *bivittatus* as a subspecies—even as such it is a valid taxon with a discrete range. The only possible justification for the inclusion of *molurus* in the analysis was that it dramatically increased the geographic area fitted to the resulting suitable climate model.

In the years that have passed since Rodda et al. (2009), they have not performed a separate analysis restricted to *bivittatus* and it does not appear their superiors have insisted on it. We suspect that this is because the resulting climate model would

likely contradict and invalidate the exaggerated suitable climate predicted by their analysis, which formed (incorrectly) the basis for much subsequent funding and research, as well as the federal action to add many of the great constrictors to the Injurious Wildlife List (see Nolen [2012] for an overview).

2. The map of the native ranges of *molurus/bivittatus* generated by Rodda et al. (2008) is novel and incorrect in many of its details. Several areas are significantly expanded; such expansions are not supported in the literature and incorrectly increase the range of *molurus/bivittatus* too far west into Pakistan and north in China. [See Barker and Barker, 2010b, c.]

3. The four a priori assumptions identified in Rodda et al. (2011) as the basis of the hypothesis on which the analysis is based are incorrect for the following reasons:

First they did not set limits for the ranges of variation for the variables of mean monthly temperatures and mean monthly precipitation. This may be reasonable in an analysis where the locality points are within the native range of *molurus/bivittatus* [such as the presence points used in the analysis of Pyron et al. (2008)]. However, we question that there is a sound basis for a modeler to use variables from non-presence localities that exceed the limits of variation at presence localities. Exceeding these limits is based solely on the subjective judgment of the modeler and cannot be defended. If a modeler chooses data from non-presence locality points that exceed the range of variation observed at presence locality points by, say 5°C, why then not 10°C, or more? When the locality points are located well outside of the native ranges of *molurus/bivittatus*, as is true in this analysis, it seems obvious that it is necessary to identify a range of variation based on presence localities in the native range and exclude locality points where that range is exceeded.

The variation of mean monthly temperatures for the analysis of Rodda et al. (2008) ranges from mean monthly lows of 1°C at Nanyue, Hunan, China, to a mean monthly high of 37°C at Jacobabad, Pakistan. Both of these localities are significantly outside the native ranges of the two species.

As pointed out in Barker and Barker (2010a), mean monthly temperature is an incorrect and unsuitable variable. This is clearly evidenced by the python die-offs in the winters of 2009 and 2010 (Dorcas et al., 2011; Avery et al., 2010, and Mazzotti et al., 2010). The mean monthly temperatures in the areas of those die-offs were significantly greater than the minima at several of the extralimital localities used in the analyses of Rodda et al. (2008). Better variables would have been daily critical thermal minima or weekly mean thermal minima (Barker and Barker, 2010a; Engeman et al., 2011).

Second, mean monthly precipitation is an incorrect and unsuitable variable because of the incorrect map used by Rodda et al. (2008). The range of *molurus* illustrated by this map is expanded into southeastern Pakistan into exceedingly xeric habitat. Beyond that, Rodda et al. (2008) selected locality points that were further outside even the exaggerated map. We note that the minimum values of mean precipitation for both month and year are from Jacobabad, Pakistan—an extralimital locality. In fact, eight of the nine locality points with the lowest mean annual precipitation are non-presence localities and five are

extralimital to the native range of *molurus* (Barker and Barker, 2010c). These choices of both extralimital locality points and precipitation extremes that exceed any reported in python-presence localities certainly skew any model based on these data.

Third, the climate model of Rodda et al. (2008) is based on the authors' a priori assumption that Burmese pythons can and do hibernate in nature. This is without valid basis in the literature and has been experimentally demonstrated to be false in Mazzotti et al. (2010), Avery et al. (2010), Dorcas et al. (2011), and Barker (2008). Cota (pers. com.) reports that Burmese pythons in Southeast Asia are found at low elevations, usually below 200 m and very rarely higher than 1000 m. The assumption of hibernation, in particular, allowed the authors to choose locality points in China that are significantly extralimital.

Fourth, likewise, the a priori assumption that Burmese pythons estivate is necessitated by the authors' choices of locality points with extreme temperature maxima. This assumption is a rationalization to explain how pythons could survive in [extralimital] Jacobabad with **three consecutive months of mean temperatures of 35–37°C**. Indeed, pythons must occasionally seek shelter from high temperatures but this behavior is not necessarily estivation. The ability of pythons to undergo the slowing of metabolism necessary to correctly be identified as estivation is unknown and not supported in the literature.

In other words, all a priori assumptions on which the climate model of Rodda et al. (2008) are based are incorrect.

A comparison of the two climate models

We compare the climate models and predictions of Rodda et al. (2008) and Pyron et al. (2008) using two of the four tests described in Rodda et al. (2011) and discussed here earlier. Two of the tests—minimum training presence and overfitting—could not be used in a comparison as those values are not available for the analysis of Rodda et al. (2008).

Native Range Inclusion: The climate space model of Pyron et al. (2008) very closely approximates the native ranges of *molurus/bivittatus* and is distinctly superior to the model of Rodda et al. (2008) [see Figures 3 and 4]. That of Rodda et al. (2008) grossly overestimated the range of *bivittatus* in China, with an estimated 60% or more of the predicted Chinese range well outside the known native range (Barker and Barker, 2010b). Suitable climate is predicted in China north to Shandon Province, at least 6 degrees of latitude north of the known range of *bivittatus* in China. Additionally the model extends into the Himalayan Mountains, onto the Tibetan Plateau, all of Pakistan, and northwest into Iran, and in Turkmenistan and Tajikistan north of 40°N latitude, there to continue west off the map—all far outside the native range of *molurus*. It also includes all of the Malaysian Peninsula and all of Indonesia that is illustrated.

Eco-plausibility Test: At this time the predicted suitable climate model of Pyron et al. (2008) seems to be nearly exactly correct (Figure 1). This model identifies only southern Florida and limited areas of Cameron County at the southern tip of Texas. The observed die-offs of pythons due to the cold winters of 2009 and 2010, as reported in Dorcas et al. (2011); Avery et al. (2010); and Mazzotti et al. (2010), combined with the subse-

quent significant drop in reports of pythons in 2011 (173) and the first quarter of 2012 (23) appear to support the predictions of Pyron et al. (2008). More importantly, this illustrates the inaccuracy of the a priori assumption of Rodda et al. (2008) that Burmese pythons are capable of hibernation.

We point out that despite possible suitable climate, there are both biotic and abiotic factors that exclude *bivittatus* from establishing in South Texas. Most obvious is the absence of a 1.5-million-acre swamp that is a protected national park. The probability of the establishment in South Texas of any large alien snake species approaches zero when factors of intensive agriculture, human presence, automobile traffic, severe habitat disturbance and alteration, generally xeric conditions, and more, are considered.

In comparison, the suitable climate model of Rodda et al. (2008) fails the eco-plausibility test. This model includes the Eastern Seaboard north to include Washington, D.C., and the Eastern Shore of Maryland. The model includes a wide swath across the southern continental USA, including: Arkansas and parts of southern Tennessee; most of Oklahoma and barely into Kansas; essentially all of Texas; southern New Mexico and Arizona; parts of Utah and southern Nevada; and most of California. Winter temperatures of -27°C (-17°F) have been recorded in Oklahoma City—this is an area well within the area of suitable climate mapped by Rodda et al. (2008). The mapped suitable climate appears to include all of northern Mexico.

It is difficult to further evaluate the eco-plausibility of the suitable climate model of Rodda et al. (2008), as the authors do not display the areas of Latin America, Africa, Europe and Australia that are predicted to be suitable. However, based on such predictions of the model as are evidenced in Figures 2 and 4, it seems likely that this model indicates as suitable essentially all land areas around the globe between 30°N latitude and 30°S latitude, and even beyond that in some areas.

Criticisms of the model of Pyron et al. (2008)

The general criticism of Rodda et al. (2011) is that the model of Pyron et al. (2008) looks at realized climate space rather than fundamental climate space. Further, mention is made that the data may be overfitted by using 19 variables in the MaxEnt analysis, and that the authors committed data dredging when analyzing their data. A specific mistake noted by Rodda et al. (2011) is that Pyron et al. (2008) mistakenly incorporated four localities into their data set of 90 locality points that are localities of *Python brongersmai*. These four locality points are located close together in southern Thailand.

It is hypocritical that Rodda et al. (2011) criticize Pyron et al. (2008) for accidentally incorporating the four non-presence localities in the area of the Isthmus of Kra into their locality data set when the furthest of these from known Burmese python localities is 150 km (Cota, 2010) and all are well inside the area of suitable climate predicted by Rodda et al. (2008). We question how these four localities differ from the 142 non-presence points in the data set of Rodda et al. (2008), particularly in light of the fact that 29% of those localities lie outside the native ranges of *molurus/bivittatus* (Barker and Barker, 2010c). Rodda

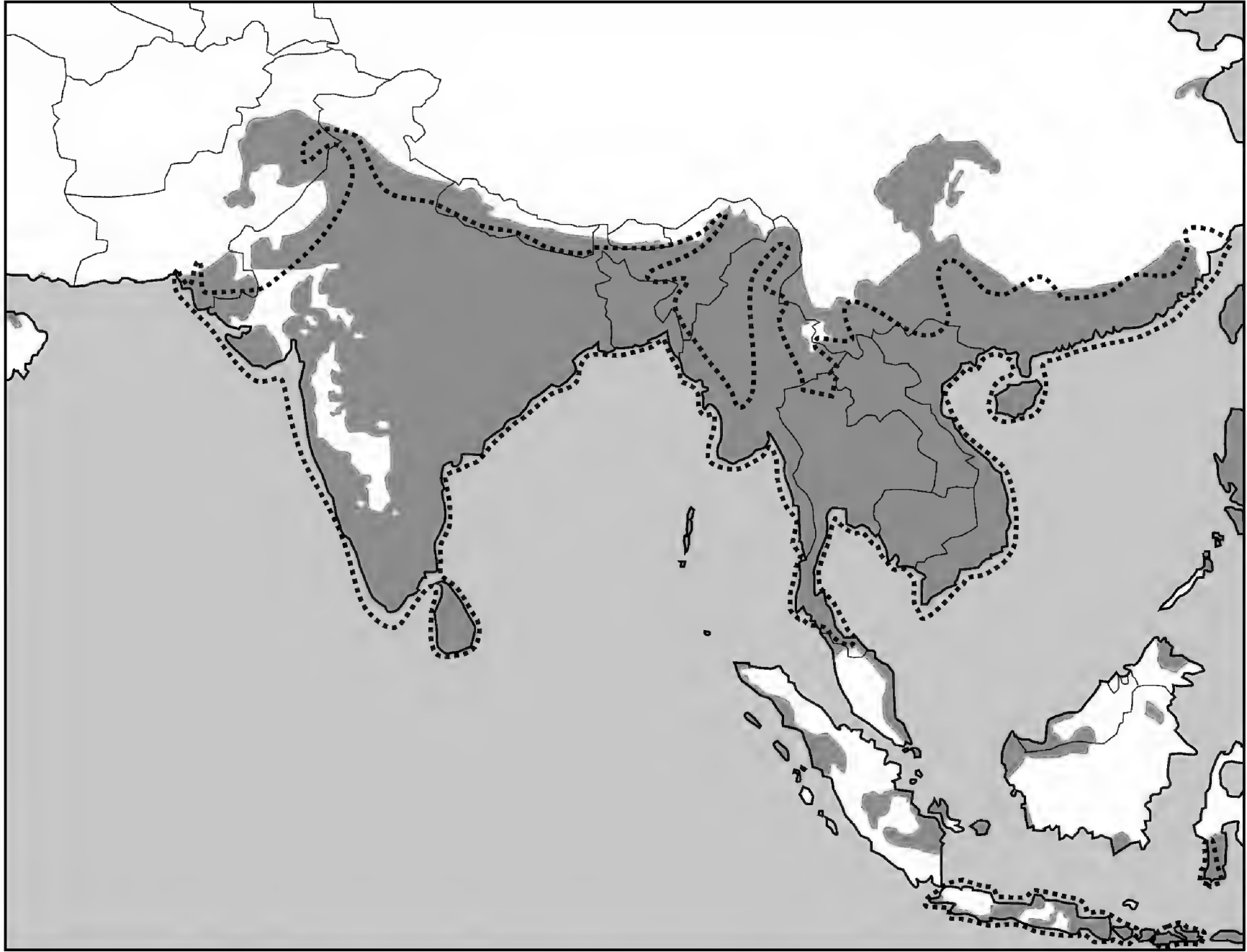


Figure 3. The dotted line represents the borders of the combined native ranges of *Python molurus* and *Python bivittatus* (Barker and Barker, 2010c). The dark-shaded areas represent suitable climate in the native range as predicted by Pyron et al. (2008).

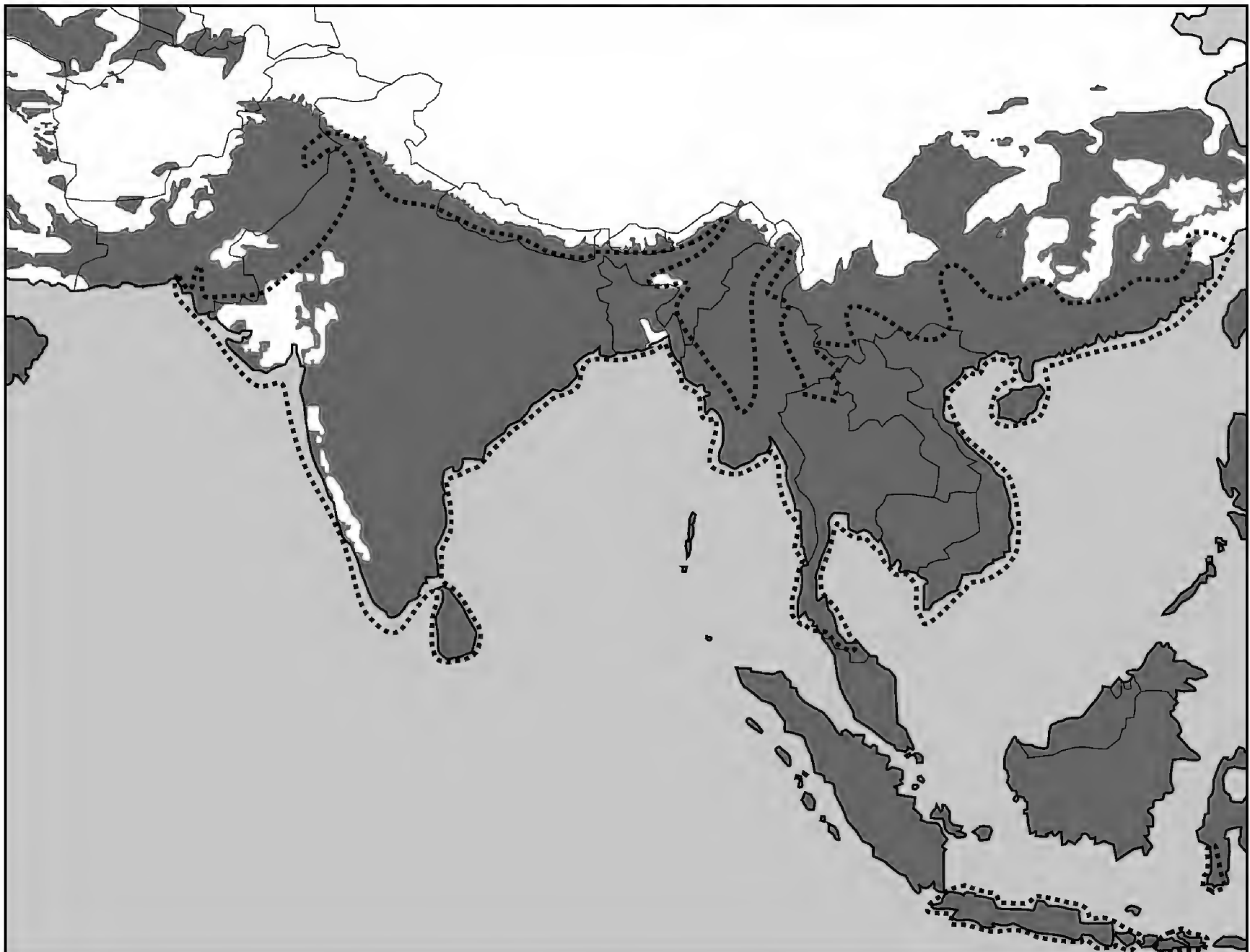


Figure 4. The dotted line represents the borders of the combined native ranges of *Python molurus* and *Python bivittatus* (Barker and Barker, 2010c). The dark-shaded areas represent suitable climate in the native range as predicted by Rodda et al. (2008).

et al. (2011) even warn against the use of localities that might represent “sink habitats,” those being aberrant outlier localities based on presence, yet they include many outlier non-presence localities in their data set, with many of them, such as the four in Hunan Province, hundreds of kilometers outside the native range of either species. As the most extreme example, Rodda et al. continue to include in their data set the anecdotal report of Liu (1986) [incorrectly cited as Deyang, 1986] of a dead Burmese python found crushed in a parking lot in northern Sichuan Province, approximately 1600 km north of the native range of *P. bivittatus*. [See Barker and Barker (2010b) for discussion of the two reports of *P. bivittatus* from Sichuan.]

We note that the data set on which the analysis of Pyron et al. (2008) is based also combines the two taxa, *molurus* and *bivittatus*. We assume this was, at least in part, for reasons of comparison to the model of Rodda et al. (2008). Indeed, in 2008 the taxon *bivittatus* was considered to be a subspecies of *Python molurus*; nevertheless, only a single taxon, *bivittatus*, is established in southern Florida and analyses should have been restricted to this single taxon (Barker and Barker, 2010c). Therefore—as with the model of Rodda et al. (2008)—the inclusion of *Python molurus* in the analysis invalidates any conclusions or predictions regarding Burmese pythons that could be derived from the model of Pyron et al. (2008).

Criticisms of the model of Rodda et al. (2008)

Pyron et al. (2008) state that the analysis of Rodda et al. (2008) deviates from normal protocol and may be underparameterized. This has resulted in an overprediction of the present-day distribution of *molurus/bivittatus* in their native ranges, which, in turn, raises the possibility that the subsequent predictions for the United States are overly broad in representing potential areas of further colonization.

Rodda et al. (2011) do not specifically or directly address any of the criticisms that have been made of the climate model of Rodda et al. (2008) by Barker and Barker (2008, 2010a, b, c). However, many of the issues that we raised in those papers are answered indirectly in their paper through the opinions of the authors on the importance of fundamental climate space versus realized climate space.

No matter whether those opinions are valid or not, and despite their explanations, the model of Rodda et al. (2008) is based on two taxa, one of which is irrelevant to this problem. Furthermore, the analysis is based on four false a priori assumptions; locality points were chosen without consideration of the presence or absence of pythons with only 7 of 149 records based on presence; and a significant number of locality points used in the analysis are far outside the native ranges of both *molurus* and *bivittatus* (Barker and Barker, 2010c).

The argument of Rodda et al. (2011) for the importance of fundamental climate space (an overestimated projection) boils down to “better safe than sorry”; i.e., it is better to overestimate rather than underestimate potential suitable climate space for invasive species. It must be a great temptation for a modeler to overestimate any climate model. An underestimated model may eventually be proven wrong. An overestimated model is never

wrong—it just hasn’t happened yet. This logic makes all climate models suspect.

Rodda et al. (2011) have applied this precautionary principle to overestimate even beyond the fundamental climate space. The flaws we have specifically pointed out in the data set of this analysis (earlier in this text and more in Barker and Barker, 2010c) are obvious, and egregious, raising the question of how this could pass internal departmental and journal review. The authors didn’t even restrict their locality points to within the boundaries of their own exaggerated range map. Twenty-nine percent of the locality points in the data set do not lie within the native ranges of either python species [some are more than 1000 km outside the native ranges] and many locality points far exceed reasonable limits of habitable elevation.

Conclusion

One of the weaknesses of climate match modeling is its subjectivity. Such models ignore countless critical biotic and abiotic factors of ecosystem and environment, many of which are interlinked and some of which are stochastic and unpredictable. Undoubtedly most climate modelers attempt to use maximum objectivity when obtaining and analyzing data, but because they don’t have to, this type of analysis is weakened and draws suspicion to every such model. Engeman et al. (2011) point out that there are no set protocols for climate match modeling, which can lead to such highly divergent results as those of Pyron et al. (2008) and Rodda et al. (2008).

According to Rodda et al. (2011), the model of Pyron et al. (2008) is overfitted and the predictions of suitable climate or ecological niche are too conservative. According to Pyron et al. (2008), the model of Rodda et al. (2008) is too simplistic and based on a biased and inaccurate data set that led to exaggerated predictions. Based on our analysis, both models are flawed and incorrect.

The model of Rodda et al. (2008) was used as a component in a publicity campaign. This is clearly evidenced by the press releases from USGS and the media frenzy that followed. The authors and their colleagues gave misleading and deceptive interviews in the weeks and months that followed the release of the paper, all serving to overstress and amplify the potential problems and dangers of Burmese pythons in south Florida, none of which have actualized in the years that have followed.

The USGS, USFWS, and the Department of the Interior made no attempt to correct the misinformation generated by their employees that was rife throughout all media. There was no effort made to communicate with either the media or the public to explain that the predictions of a climate model are not an actual view into the future. This model proposed to predict only suitable climate and was not any prediction of suitable habitat, suitable niches, or future distribution. The strength of any ecological model depends on the accuracy of the data on which the predictions are based; even the strongest models cannot create or control the future. Predictions for systems as complex and highly integrated as the environment and ecosystems are only guesses, not truths.

Federal regulations that list Burmese pythons, Indian pythons, and three other great constrictors on the Injurious Wildlife list were based largely on the flawed predictions of Rodda et al. (2008). This is at a huge cost (Nolen, 2012), financial and

otherwise, to tens of thousands of American citizens who keep snakes. At the very least, a valid reanalysis should be conducted, preferably in conjunction with a retraction of Rodda et al. (2008) and Reed and Rodda (2009).

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What You Missed at the May Meeting

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It's wrong, I know. I shouldn't be such a sucker for neat graphics, pretty pictures or great organization. Much meat can be found hiding away from the dazzle of the superficial. There are many ideas that are worth the trouble of wading through complicated, poorly written, and lightly illustrated papers, books and presentations. But, it's so much more fun when someone has already done the hard work for you and can present potentially complicated concepts in an interesting, clear, and dare I say, entertaining manner. Call me lazy . . . wait, I'll call myself lazy, but Dr. Tony Gamble's presentation was a perfect example of how I wish all of my college lectures could have been prepared and delivered. If that had been the case, I might have even gotten grades I could brag about (Hey! I *did* graduate. Mostly because I think the school didn't want me hanging around any more).

When I met Tony I mentioned how much I liked his web site (<http://www.tc.umn.edu/~gamb1007/>). He seems to be an open and forthright individual and expressed surprise at my praise. He didn't think it was that good, but he's got PDFs of his many papers, interesting links and cool photos from his field trips. Commenting on a couple of his photos elicited the stories associated with them, and I delighted in the details involved in the acquisition of the pictures. He's an easy guy to like, and not just because we share a similar hairline. His web site shows diverse interests, but we were going to receive information on his primary focus, geckos.

Here's what Tony writes about himself on his web site: "I am a postdoctoral researcher in Dave Zarkower's lab at the University of Minnesota. I use phylogenies to study biogeography, speciation, taxonomy, and the evolution of novel traits in amphibians and reptiles. My current research examines the evolution of sex determining mechanisms in reptiles."

Using geckos, he was to give us a brief glimpse of nearly everything that his studies pursue, educating us with a well-written, well-organized, humorous presentation illustrated with pretty pictures and neat graphics. He titled it, "Ancient Lands and Sticky Hands: Gecko Biogeography and Evolution."

Tony started by giving us some definitions and explanations that would allow us to more easily appreciate his points. Phylogenies are evolutionary trees showing the relationships between organisms and ancestors. They are constructed with branches that fork from nodes representing the organisms and their ancestor. A clade is an ancestor and all its descendants, and they can nest within one another. Tony used excellent graphics to demonstrate these terms, and I suggest that one can find much information about these terms in better places than this article if you are still uncertain.

Next he gave us a little background on model organisms,

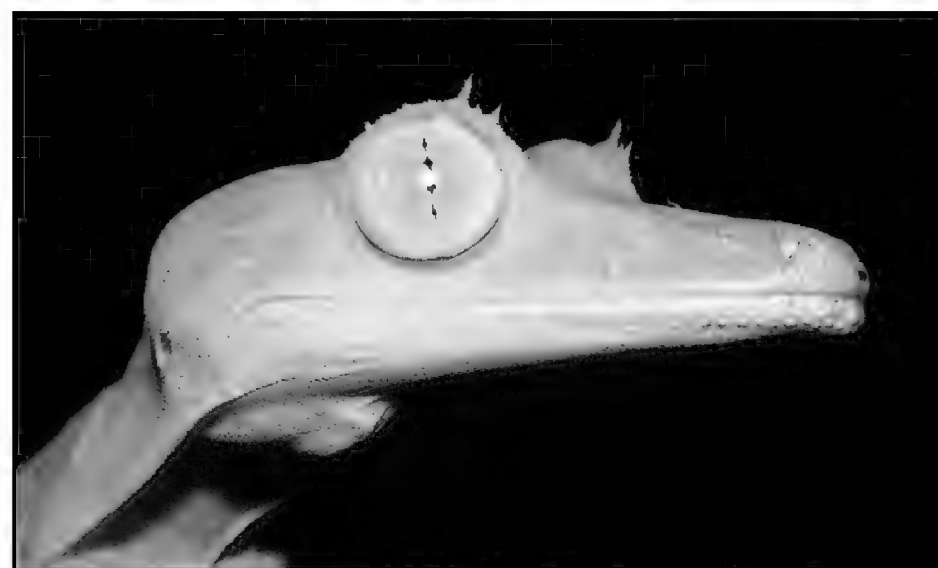


Tony Gamble. Photograph by Dick Buchholz.

showing a quote from August Krogh illustrated with a great belly shot of a gecko: "For a large number of problems there will be some animal of choice or a few such animals on which it can be most conveniently studied."

Scientists can use model organisms to represent other groups of animals that may be impossible to study otherwise. Mice and fruit flies are perhaps the best known such models. Repeated or convergent evolution in a well-chosen model can allow scientists to draw conclusions about the evolutionary process. Statistical analysis of DNA can even allow researchers to deduce traits of extinct ancestors.

Then Dr. Gamble defined geckos. Of course he began with a slide illustrating that geckos are the only reptiles that sell insurance, but they are so much more. As of the week before his presentation geckos consisted of 1,482 species in 118 genera, with over 30 new species having been described in each of the last six years. Most geckos actively vocalize, have sticky toe pads, no eyelids, nocturnal habits, and a fixed clutch size of two eggs, though exceptions exist to all of these traits. They have a global distribution that tends to favor alluring climates and are accessible to scientists working nearly everywhere. They have an ancient lineage, emerging during the Triassic, and are the sister clade to all other squamates with the exception of dibamids (look them up). They are morphologically diverse, ranging in size from the now second-smallest vertebrate (*Sphaerodactylus ariasae*), illustrated sitting on a dime that Tony claimed was the only way anyone ever photographed them, to a probably extinct species (*Hoplodactylus delcourti*) represented by one known specimen a little smaller than a house cat shown being held by someone Tony was pretty sure was Dracula (lighting is everything in a photograph). Geckos are easy to care for and easy to breed. As you may have figured out by now, all of these things make geckos a nearly ideal model for the study of many questions. Thanks to a refined phylogenetic tree illustrating several cases of repeated evolution, they're particularly useful in modeling evolution.

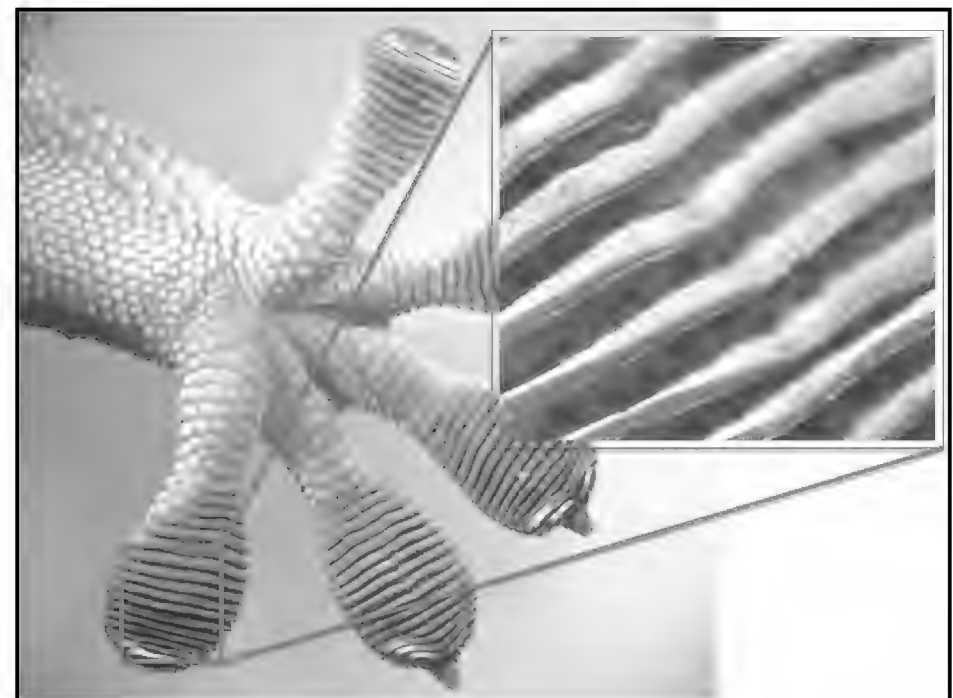


Lined flat-tailed gecko, *Uroplatus lineatus*.

I thought that Tony's next topic was really interesting but unfortunately I can't reproduce his presentation as he charted the progress of gecko taxonomy from Fitzinger in 1843 to the present. Using colors and clades he revealed the evolution of gecko phylogeny from early scientists using morphological characteristics to present-day efforts using DNA. Step-by-step he moved us through the attempts to wrest order from a most confusing taxon, along the way convincing us of the value of DNA analysis, especially where repeated evolution had occurred. This part of his talk would be dry and boring if I attempted to describe it, but as Tony moved through the history of gecko systematics, it was a delight to be able to follow the mistakes, and often the reasons for them, of his predecessors. At the same time Tony admitted that the refining is ongoing. As he talked, I realized Dr. Gamble had not only convinced me of the value of accurate taxonomy, but had also made a discipline I had thought boring into something I now looked upon with interest.

Tony then used brilliant maps and colorful graphics to elucidate how a proper phylogeny could shed light on the biogeography of geckos. He worked us through the conclusions generated from a close study of the 162 species of New World geckos and their place on the phylogenetic tree. A graphic of a time-calibrated phylogeny using multiple fossils and biogeographic calibrations enabled Tony to lead us through his thoughts on what species probably were present in the New World when Gondwanaland broke up, what species probably dispersed over the seas, species that may have crossed land bridges, and what species were likely introduced by humans to the new world. Geckos are known to be exceptionally capable of dispersing over water, inhabiting volcanic islands far from other land. Some species not only have sticky toes but also sticky eggs that may cling to flotsam for long periods. Some eggs can even survive immersion in salt water for several days.

So far Dr. Gamble had discussed the history and thinking behind gecko phylogeny and explored an aspect of the biogeography of his favorite reptile with us. Along the way he captured our attention by discussing the importance of correct taxonomy. Now he moved into what sticky toes could reveal to an inquisi-

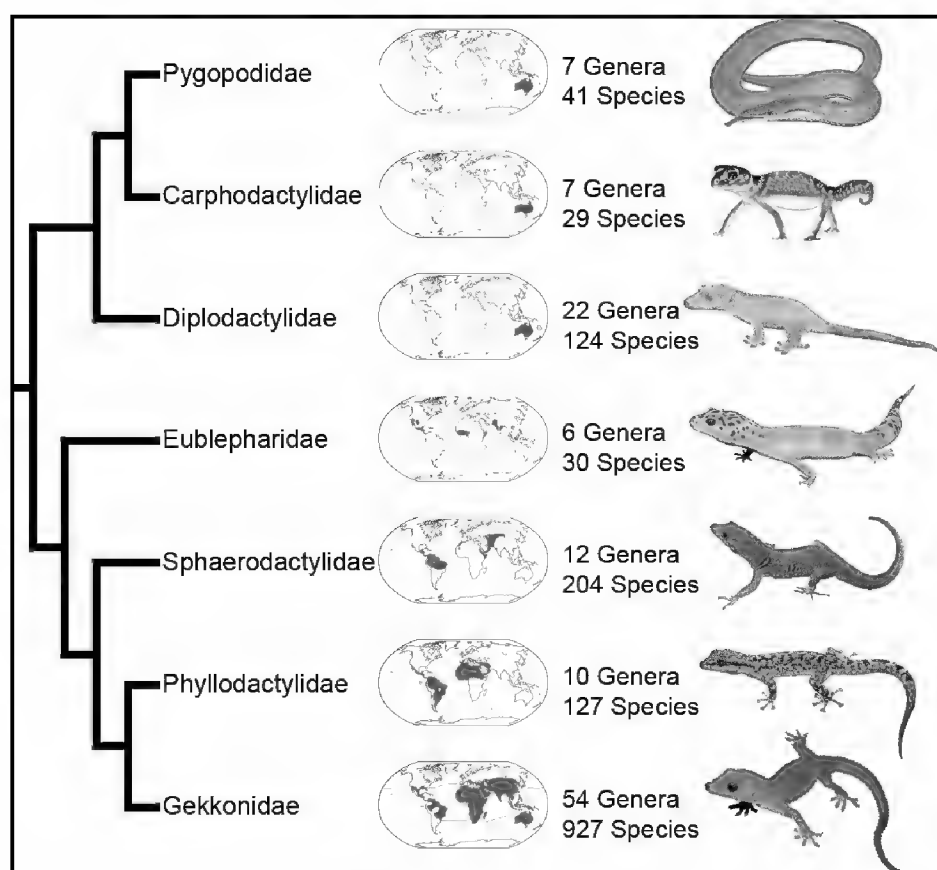


Adhesive toe pads of a species of *Tarentola*.

tive mind. Reflecting the morphological basis of early taxonomists, *dactylus*, which means digit or toe in Latin, appears in the names of about 25% of all gecko genera. As diverse as gecko toes are, using them appears at first glance to be an excellent way to differentiate clades in geckos, but DNA analysis has revealed a phylogeny indicating that sticky toes have repeatedly evolved in unrelated gecko taxa. But before diving into that area, Tony showed us how those those sticky toes work. Cool electron photomicrographs, showed setae with bristly ends that make up the lamellae lining the bottom of gecko toes. Using weak Van der Waals forces, each tip of these minute structures exerts a slight attractive force. The tokay gecko (*Gekko gecko*) has six and a half million of these, together capable of exerting a holding force of 290 lbs. While all of the setae are never in contact with another surface at one time, a 50-gram (about a tenth of a pound) lizard has no problem running across a ceiling with only a small portion of its toes in contact.

Tony used gecko phylogeny to show us clear cases of repeated evolution of these extraordinary toes, also demonstrating specific instances of unambiguous gaining of sticky toes from a non-sticky ancestor and unambiguous loss of stickiness from a sticky ancestor. Without an accurate phylogeny, these cases would have been impossible to discern. Again he carried us through a relatively complicated explanation with excellent graphics and always-cool pictures of geckos. He discussed the probability of evolving these complicated structures, showing us how all reptiles have setae on some scales, but geckos have them everywhere, and especially on the toes. Showing examples of different degrees of modifications, he showed us how a series of step-by-step changes in the lizards' skeletons, muscles, tendons, and of course lamellae, could lead to a house gecko sprinting across the ceiling with ease.

And with ease is how I took in Tony Gamble's presentation. In about an hour he gave us insights into a complicated and often obscure area of biology by choosing and designing excellent graphics, enlivening it with neat gecko photos, and organizing it so that even I could follow his thinking. He also gave us a quick view of what is in store with gecko studies in the near future. When Tony gains a professorship, I'd like to audit his class. He's the type of guy that can make even me feel smart.



Family relationships among the Gekkota.

Unofficial Minutes of the CHS Board Meeting, May 18, 2012

The meeting was called to order at 7:40 P.M. at the Schaumburg Public Library. Board members Barbara Khan, Deb Krohn and Jenny Vollman were absent.

Officers' Reports

Recording Secretary: In Jenny's absence, Mike Dloogatch read the minutes from the March 16 board meeting.

Treasurer: Andy Malawy presented the financial reports for February, March and April. He also presented a preliminary financial report for ReptileFest.

Vice-president: Cindy is looking for different ways to publicize CHS meetings and speakers.

Membership Secretary: Mike Dloogatch shared the list of recently expired memberships. We gained at least 10 members over the past month.

Sergeant-at-arms: Cindy reported counting 58 people at the April general meeting.

Committee Reports

Shows:

Dick wants to put out donation cans at some shows. His idea was to keep the money from the cans to cover expenses. Mike Dloogatch suggested that he turn in any such monies to the treasurer, supply receipts, and get reimbursed with a CHS check instead. Dick agreed that this would be a good way to do it.

- Notebaert, first full weekend of each month. Josh Chernoff is coordinator.
- Cosley Zoo, May 19. Dick Buchholz is doing a turtle display.
- Meet the Creek, Kiwanis Park, Brookfield, June 9. Jenny is looking for volunteers.
- Rockin' for the Reptiles, Midwest Museum of Natural History, Sycamore, June 30. Dick is looking for volunteers.
- SEWERfest, August 5, 10-3. They donate a table to the CHS.

Adoptions: Linda has a ton of corn snakes and also box turtles, not to mention the red-eared slider and iguana calls. Bob has ball pythons and boas.

ReptileFest: Jason Hood went over a variety of things that were discussed at the 'Fest wrap meeting, including ideas for next year's 20th anniversary.

Old Business

Jason and Steve Sullivan are still working on organizing a Junior Herper Club.

National Herpetological Society: Jason reports not much going on. There will be a second conference call soon and he hopes things will get rolling and move forward.

New Business

Conservation donations: Jason Hood suggested that we look at donating some money to conservation efforts. The ones discussed were Amphibian Ark, massasauga studies, DAPTF, TSA, IRCF, Will and Dupage County Forest Preserve Districts. It was

the consensus that we need to gather a little more basic info so we can vote properly.

Steve Sullivan wrote a letter to *Chicago Parent* magazine objecting to an article they ran that included a photo of a gaboona viper being free-handled. Before mailing it, Steve emailed a copy to CHS board members to see if there were any objections or additions.

We need to order more "Come to the Meeting" magnets, and some basic office supplies.

Jason asked about the need to obtain photo releases if we use people's likenesses in a new membership flier. Bobby Delany and Mike Heinrich will work on this.

Cindy moved to give the Phipps family a free membership in thanks for Todd's work on the photo booth at ReptileFest. Lawrence seconded and the motion passed unanimously.

Cindy moved to make a donation of CHS merchandise to the ETHS Sanderson Snake Days. Aaron seconded and the motion passed unanimously.

Mike asked for volunteers to write up both of the June meetings for the *Bulletin*.

Jessica is doing a talk at an art convention and wanted to let the board know she will be discussing her involvement with the CHS.

Round Table

Nancy and Gary shared their artwork.

Jason has carpet pythons hatching.

The meeting was adjourned at 9:30 P.M.

Respectfully submitted by Cindy Rampacek



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Line ads in this publication are run free for CHS members — \$2 per line for nonmembers. Any ad may be refused at the discretion of the Editor. Submit ads to mdloogatch@chicagoherp.org.



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UPCOMING MEETINGS

The next meeting of the Chicago Herpetological Society will be held at 7:30 P.M., Wednesday, June 27, at the Peggy Notebaert Nature Museum, Cannon Drive and Fullerton Parkway, in Chicago. This will be our popular and always well-attended annual **Show & Tell** meeting. Bring an animal that you find interesting for one reason or another and be prepared to give a short (under five minutes) presentation to the group. Don't be shy. Neither age (yours) nor commonness (the animal's) should be a limitation.

At the July 25 meeting **Gerry Salmon** of Boerne, Texas, will present a program on "Saving Herps --- One at a Time: Working as a Timber Rattlesnake Monitor on the Tennessee Gas Pipeline in Northern New Jersey and Northeastern Pennsylvania." Gerry has been an avid naturalist for most of his 51 years. He has a strong interest in herpetology and especially geographic distribution of North American reptiles and amphibians. He is also a long-term contributor to northeastern timber rattlesnake (*Crotalus horridus*) field biology and conservation efforts that became the basis for a recent seasonal job. His presentation consists of highlights of that work and is an opportunity to see some interesting herps of the Northeast. Gerry has spoken several times in the past at our monthly meetings on kingsnakes of the *mexicana* complex, timber rattlesnakes, and herping in South Carolina.

The regular monthly meetings of the Chicago Herpetological Society take place at Chicago's newest museum—the **Peggy Notebaert Nature Museum**. This beautiful building is at Fullerton Parkway and Cannon Drive, directly across Fullerton from the Lincoln Park Zoo. Meetings are held the last Wednesday of each month, from 7:30 P.M. through 9:30 P.M. Parking is free on Cannon Drive. A plethora of CTA buses stop nearby.

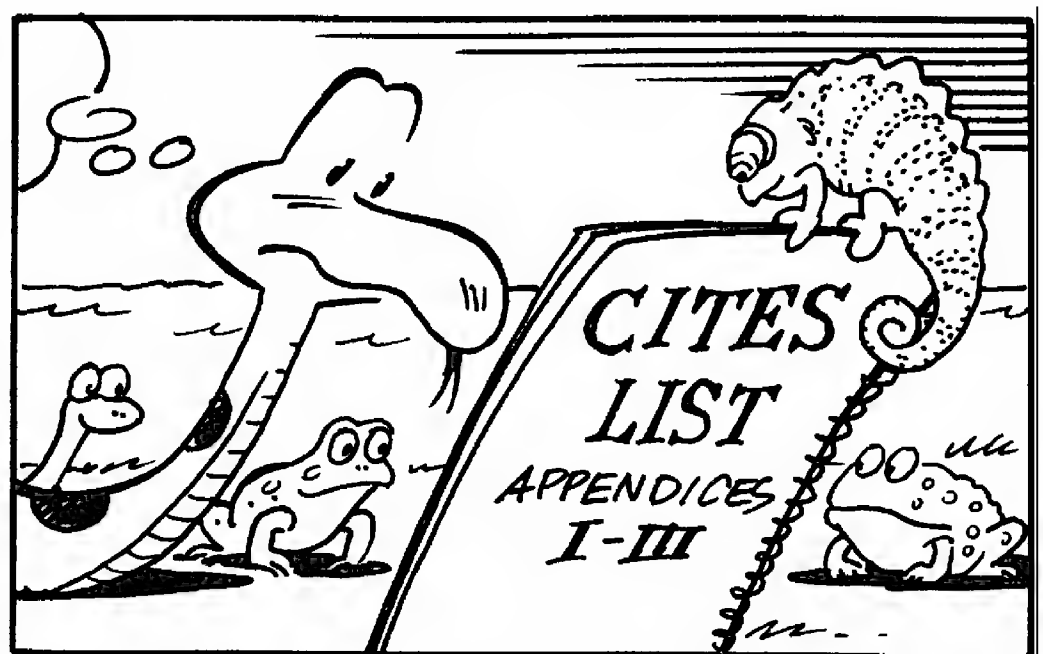
Board of Directors Meeting

Are you interested in how the decisions are made that determine how the Chicago Herpetological Society runs? And would you like to have input into those decisions? If so, mark your calendar for the next board meeting, to be held at 7:30 P.M., July 13, in the adult meeting room on the second floor of the Schaumburg Township District Library, 130 S. Roselle Road, Schaumburg.

The Chicago Turtle Club

The monthly meetings of the Chicago Turtle Club are informal; questions, children and animals are welcome. Meetings normally take place at the North Park Village Nature Center, 5801 N. Pulaski, in Chicago. Parking is free. For more info visit the group's Facebook page.

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of the

Chicago Herpetological Society



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The Key West Turtle Kraals Museum—But a Short Step Back in Time	David S. Lee	81
Notes on Reproduction of Desert Horned Lizards, <i>Phrynosoma platyrhinos</i> (Squamata: Phrynosomatidae) from Southern California	Stephen R. Goldberg	89
The Tympanum	Paul Breese	92
Unofficial Minutes of the CHS Board Meeting, May 18, 2012		92
Herpetology 2012		93
Advertisements		96

Cover: Alice with the Mock Turtle and the Gryphon. Drawing by Sir John Tenniel from *Alice's Adventures in Wonderland* by Lewis Carroll, 1866.

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The Chicago Herpetological Society is a nonprofit organization incorporated under the laws of the state of Illinois. Its purposes are education, conservation and the advancement of herpetology. Meetings are announced in this publication, and are normally held at 7:30 P.M., the last Wednesday of each month.

Membership in the CHS includes a subscription to the monthly *Bulletin*. Annual dues are: Individual Membership, \$25.00; Family Membership, \$28.00; Sustaining Membership, \$50.00; Contributing Membership, \$100.00; Institutional Membership, \$38.00. Remittance must be made in U.S. funds. Subscribers outside the U.S. must add \$12.00 for postage. Send membership dues or address changes to: Chicago Herpetological Society, Membership Secretary, 2430 N. Cannon Drive, Chicago, IL 60614.

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The Key West Turtle Kraals Museum—But a Short Step Back in Time

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For well over 150 years the green turtle industry was to the economy of Key West as commercial whaling had been to New Bedford

In the early 1800s when people first started constructing turtle kraals* in the Florida Keys, Florida was not yet a U.S. territory, the Keys were not connected to the mainland, a few pirates still roamed the seas, and no one had even thought of giving hurricanes names. The Keys were essentially uninhabited and neither the pirates nor storms could find much to plunder. As a child I first visited the Key West turtle kraals in the 1950s and later returned in my college days in the early '60s. At the time they were still in the business of processing green turtles for meat and soup. The town's major industry was originally built on the local abundance of green turtles, but well before the time of my first visits Key West had become totally dependent on turtles imported from the coastal areas of Mexico and Central America. Local sponge fishing had also become less important in the Keys, and by the mid-1900s shrimp and later drugs dominated the Key West economy. While local restaurants still offered various dishes prepared from green turtles, by the mid-1900s the Keys were better known for sport fishing and key lime pie. Still at least one company remained that was canning green turtle soup and sending fresh turtle meat to northern markets (U.S. Fish and Wildlife Service, 1954). By the time of my later visits in the early '70s through the early '80s the kraals were becoming a tourist attraction. Adult green and other species of marine turtles were exhibited in the kraals, there was some information on the local history of the turtle industry, but a large percentage of the one remaining building had become mostly a gift shop for tourists. Yet, even then, Key West was not the tourist destination it is today, and the kraals were one of only a handful of attractions open to the public. By the '60s the Caribbean turtle populations had totally crashed and fishing boats were bringing in fewer and smaller turtles. In the mid-'70s the protection of green and other sea turtles provided by the Endangered Species Act finally closed down Key West's already fading soup and turtle meat canning industry.

This winter I again visited Key West to find that what little remained of the once important economic component of the town's economy had been transformed into a museum. The original kraals and supporting structures had fallen into disrepair and time and tropical storms had taken their toll. The site of the kraals was renovated into the museum, a number of artifacts from the days of the green turtle industry were recovered from the area, and the revamped facility opened its doors to the public in 2009. This museum fills an important role in preserving the history of green turtle exploitation. Despite the existence of the canning industry well into the 20th century, the information



Figure 1. A green sea turtle confined in one of the kraals. Photographed by the author in November 1971 when the cannery was in the process of closing its operation.

currently available about the history of this important Key West industry is scattered and scant. Ernst and Lovich (2009), for example, devote 26 pages to the biology of *Chelonia mydas* without a single word about the extensive and historic Key West turtle operations.

The kraals at Key West started to appear in the early 1800s, perhaps earlier, as historical information is sketchy. The local economics of harvesting green turtles changed dramatically in the early 1800s. Florida became a territory of the United States in 1821 and in 1826 the U.S. Revenue Cutter *Marion* worked through the Keys removing 20–30 Bahamian turtling boats so that the lucrative green turtles were available solely for American enterprises. By 1828 the population of the Keys was 421 permanent residents; 100 of these were turtlers and fishermen. Many of these residents were “Conchs,” Bahamian immigrants and their descendants, who formed the core of the key's original green turtle industry. Florida did not become a state until 1845. By 1885 at least half a dozen boats, each employing about five men, were dedicated to turtling.

John James Audubon after visiting Key West in 1832 noted “Each turtle has its ‘crawl,’ which is a square wooden building or pen, formed of logs, which are so far separated as to allow the tide to pass freely through, and stand erect in the mud. The turtles are placed in this enclosure, fed and kept there until sold.” (Audubon, 1870, p. 265). The kraals were typically constructed on the leeward sides of the island or in sheltered areas where they received protection from waves and swells from the

* “Kraal” is a South African term for a livestock enclosure, or stockade, and was likely derived from the Portuguese *curral* or the Spanish *corral*. The modern-day reference to “turtle crawls” is perhaps a folk etymology based on a combination of the word “kraal” and the actions of the captive turtles within the enclosures. The term “crawls” was later used for enclosures designed for the captive breeding of diamondback terrapins. In the early 1900s terrapins propagated by the U.S. Fish Commission at Solomon's Island, Maryland, and Beaufort, North Carolina, were housed in terrapin crawls.



Figure 2. a) The author at the Key West Turtle Kraals in December 1983. The cannery had closed down but the structure was used as a gift shop and marine turtles of various species were maintained in the kraals as a tourist attraction. (photograph by M. K. Clark). b) Eventually the Kraals closed down and the abandoned cannery building soon fell into disrepair.

open sea. The wave action not only over time destroyed the structure of exposed kraals, but caused harm to the turtles that were crowded into the individual pens. The structures were often built under existing docks in areas where the water was at least five feet deep and the posts, originally made from palmetto trunks, were later constructed with concrete (Figure 1). Trap-doors in the docks allowed access to the turtles.

Up through the mid- to late 1800s green turtles remained abundant in the Florida Keys. For the most part the turtles were collected on the beaches when the females came ashore to nest. During the full moons from May through July nesting females ascended the beaches by the hundreds to nest throughout the Keys. The turtles were flipped onto their backs and the eggs and turtles were later collected once the last turtle had been turned. An account written in 1887 states that this went on night after night on almost every key. Floating nets were also set at sea. The nets were placed in “sets” near known turtle resting sites, and the turtles were captured at night when they began to move about. Individual nets were 50 to 75 fathoms in length (300–450 feet) and extended down 5–7 fathoms into the water (30–42 feet). Turtles were also obtained by “pegging.” The pegs were hook-like spikes attached to a line and harpoon-like pole. The

loosely attached peg lodged into the turtle and the creatures were pulled into the fishing boats. Pegging often injured the turtles and the technique was not used much after 1900.

The first Key West cannery for turtle soup started in 1857 allowing the product to be mass-marketed to the outside world. For reasons unknown, but certainly the gearing up of the Civil War played a part, the first canning plant went out of business and the J. J Harrison’s Cannery failed. By 1880, another Key West factory was reported to turn out 200,000 cases of turtle soup a year. Ten vessels and 60 men were employed in gathering the turtles (Simmonds, 1883). In 1890 Armand Granday, a French chef, opened a new operation. Local fishermen were at first reluctant to sell their catch to an outsider, but by 1900 the cannery was processing 10–12 turtles a week. In 1908 Norberg Thompson purchased Granday’s canning plant but retained the Granday name for the soup brand and used the Thompson name for the turtle meat (Figure 3). Thompson moved the cannery to the Key West Bight, a site adjacent to the existing kraals. His actual butchering and canning technique was kept secret, but it was known that about a dozen turtles a day were processed. The green fat of the turtles was made into soup, but the meat and eggs were also sold. The cannery remained in business until



Figure 3. Labels from products produced and shipped from the Key West canning plant.



Figure 4. Postcards depicting scenes of Key West and the turtle kraals in the mid-1900s.

1957, and turtle butchering continued at the plant for another 15 years, spanning the time of my visits in the '50s and '60s and a visit in the early 1970s. The operation also became a tourist attraction. By the '60s a gift shop was added which offered, among other items, skulls of adult green turtles for \$7.00 apiece.

In the U.S. the largest company in the business of making green turtle soup was Moore and Company Soups, Inc., of Newark, New Jersey. The company had been making turtle soup since 1883. The canned soup was sold under the Ancora brand. Originally the operation was located in New York as the turtles from Key West and other ports arrived loaded on banana boats, which carried turtle tanks on their decks. But following World War II, with the opening of better roads, the turtles could be easily trucked out of New York and the company moved to New Jersey because of its increasing demands for space. The Chinese population in New York was especially fond of green turtles, and a *New York Times* article (24 August 1939) quoted a person at the Fulton Street Fish Market as saying 80% of the turtles going through the market were consumed by Chinese. During World War II, beef was hard to come by and frozen green turtle steaks sold for 75 to 80 cents a pound and were unrationed.

In 1905 Henry Flagler started the Over-Sea Railway Key West Extension project. Completed in just seven years the 120-mile railroad connected Key West to Miami and provided transport for the canneries, allowing them to distribute their products to markets other than New York and other major seaports. Flagler financed the project with money he made from his capital venture in what was to become the Standard Oil Company. He envisioned the railroad as the port connection to shipping coming through the Panama Canal. The canal was to be completed in 1913 and he foresaw Key West as a coaling stop for ships coming from the West Coast. Newer ships and fuels soon made Key West obsolete as a coaling port, but rail transport did further open up the market for green turtle products. A Category 5 hurricane destroyed much of the railroad in 1935, but with the automobile having come of age in the early 20th century the bridges that had been constructed for the railway were converted into an overseas highway. With the advent of refrigerated trucks the market for green turtles was wide open, and Eisenhower's proposed interstate highway system would provide rapid transport to northern markets via I-95.

It is not possible to appreciate the context of the Key West green turtle industry without an understanding of the historical and economic importance of the turtles themselves. The first Englishman known to eat turtle meat in the New World was John Hawkins. He visited the Dry Tortugas 1563 and reported that the turtles taste "much like veal" (Markham, 1878). The turtle's fate was set, and over time the green turtle became recognized as the world's most economically important turtle (e.g., Pope, 1967); other authors have called it the world's most valuable reptile (e.g., Parsons, 1962). While green turtles were hunted by indigenous peoples before the dawn of history, they became an important food item of European gourmands by the close of the colonial period. Through the mid-1700s, though they were still an uncommon import, green turtles were being shipped to London from the West Indies and Ascension Island.

In a popular magazine of the time it was noted that "what is common in the West Indies is a luxury here" (Anonymous, 1753). In the late 1700s, Robert Merry (1789) in reference to the use of the green fat of these sea turtles in soups, writes:

These modes, howe'er, are alter'd, and of late
Beef, but not Modesty, is out of date;
For now, instead of rich Sir-loins, we see
Green calipash, and yellow calipee.

Calipee and calipash were terms for the unossified tissues of the turtle's belly and backbone. The term calipee apparently was of Caribbean origin, and referred to the turtle's plastron, and calipash was used in reference for the carapace. The tissue is boiled to separate it from the shell and then dried in strips for shipment. An adult green turtle typically produced two-and-a-half to three pounds of this cartilaginous material. Like the diamondback terrapin that "never was intended for vulgar palates" (*NY Morning Telegraph*, 7 May 1912) green turtles were marketed in Europe and northern coastal U.S. cities for "confirmed epicures." By the mid-1700s live green turtles were being shipped to London. They were a prestigious food item and the soup was served at diplomatic dinners and ceremonial banquets.

While turtle was a favored fare of the upper class in the British Empire, this was not the case everywhere. In 1840 a soldier stationed at Ft. Pierce wrote "They are so cheep and common that the soldiers regard it as an imposition when compelled to eat green turtle steaks . . ." (Sherman, 1899; Carr and Ingle, 1959). The soldier was none other than William Tecumseh Sherman who, as a general, would later lead his infamous and devastating march through the South during the Civil War. Likewise the Spanish and Portuguese were not that taken by the green turtle as a food item, and some of the early European colonists believed that they were poisonous. The French suspected that the London connoisseurs liked turtle soup more for its rarity than its taste. To this day green turtles are not often exploited by descendants of the Spanish and Portuguese in the New World, while those of white English-speaking Protestant ancestry, and the descendants of their slaves still provide the principal market for turtles in the Caribbean region. The different cultural preferences for turtles, in turn, may have influenced the original pattern of English settlement in parts of Caribbean. It has been suggested that as much as any other factor green turtles were responsible for the colonization of the West Indies and even influenced the pattern of pirate activity in the region (Parsons, 1954; Woodbury, 1954).

In the Victorian period turtle soup made from green turtles was an established gourmet item in England, to the point that even imitation turtle soup had become a well-known commodity. For those who lacked the resources to order expensive turtle dishes substitute recipes became available. Artificial, or "mock," turtle soup could be made from a calf's head (Raffald, 1808). The Mock Turtle, one of Lewis Carroll's characters in his 1866 classic *Alice's Adventures in Wonderland* plays on this well-known dish. John Tenniel's illustrations of the Mock Turtle in Carroll's book not only show it to be part cow, but the animal parts depicted on the "turtle" were all ones discarded by meat processors—the tail, head and hooves (Figure 5). The taste for turtle soup in London and elsewhere had become well estab-



Figure 5. Lewis Carroll's play on mock turtle soup: Alice with the Mock Turtle and the Gryphon. Drawing by Sir John Tenniel from Carroll (1866).

lished by the time the Key West canneries went into operation and the stage was set for shipping to international markets.

The green turtle fishery apparently started in Bermuda, and by 1620 the Bermuda Assembly was already passing regulations to protect them (Carr, 1952) and as the turtles became scarcer the fishermen expanded their pursuit to the Bahamas and Ascension Island (Wilkinson, 1950). The turtles soon became scarce in the Bahamas as well, and the fishery turned to the Turks Islands, Cuba, the east coast of Florida and the Dry Tortugas (Carr, 1954). By the early 1900s the green turtle population in the Keys was also in sharp decline. The Key West cannery's output was only about 200 one-quart cans per day. The limited production was not caused by a lack of demand, but from the difficulty of obtaining turtles. Norberg Thompson, the owner of the processing operation noted, "At the time the industry was first started, Mr. Granday secured his turtles from about Key West, but they have become so scarce . . . turtles used in the manufacture of the soup are now caught in the Caribbean Sea, along the coast of Mexico, with some from Nicaragua." This was unusual as in other parts of the world at the time nearly all types of successful commercial fisheries were centered on species taken in local waters from boats working for the processing plants. In the final years the Key West cannery processed primarily turtles caught off Nicaragua by Cayman Island fishermen. The Cayman fishermen had harvested green turtles since the mid-1600s, but by the early 1800s their native stocks had also been reduced to near extinction. They turned their attention to fishing around the Miskito Cays of Nicaragua and found that marketing them through Key West was the most profitable.

Much of the actual green turtle fishing in the 1900s was

conducted by Cayman Islands fishermen. Schooners would sail from the Cayman Islands to sites such as the grass beds of the Miskito Cays off the coast of Central America with supplies and small, double-ended dories used to set the nets. The net sets were placed near the coral outcrops where the turtles took shelter. Turtles surfacing to breathe were snared in the nets. In the morning the catch was carried in the dories to temporary kraals. When enough turtles were captured they were loaded onto the schooners and taken to Key West. The turtles were transported on their backs and constantly wetted down to keep them from overheating. A typical voyage lasted two months and brought back 500 to 600 green turtles.

By the end of the 1800s a number of authors were writing of their concerns regarding the future of the green turtle (True, 1884; Loennberg, 1894; Brice, 1897; Munroe, 1898) and the need for conservation actions for these turtles was recognized as early as 1620 by the Bermuda Assembly in what was undoubtedly the world's first conservation legislation. Yet, the commercial exploitation continued well into the 20th century, and these turtles are still legally hunted in the Bahamas and Turks and Caicos. Even though the public was aware of the plight of the green turtle, the demand for turtle soup and steak continued to remain high through the 1950s and early '60s. In 1962 the *Key West Citizen* reported that every 4 to 6 weeks a schooner from Grand Cayman arrived at the Kraals with about 400 green turtles, some weighing up to 500 pounds, and that about 25 turtles per day were butchered. The Sidewalk Café in Key West featured their specialty—Key West turtle burgers. By 1968 the turtle boats were coming less frequently and there was often a six-month lag between arrivals. Carr (1952) wrote of the declining but still extant Caribbean turtle industry and outlined the need for specific information that would be required if effective management of the species were to ever become a reality.

In the 1960s the U.S. and other governments began to address the issues. The Department of the Interior prepared a list of "possibly endangered species" in 1964. The list of 60 species included the green sea turtle. About the same time the Nicaraguan government refused to issue permits for netting turtles. In 1969 Nicaragua and Costa Rica asked for assistance from the United Nations to prepare "emergency" regulations to help stop the netting of green turtles in their waters. Thompson saw the writing on the wall, and in 1968 sold his Key West business to Sea Farm, Inc. As recently as 1970, a spokesman for the new owner boasted that the Kraals processed over 2,000 green turtles caught off the coast of Central America per year.

The Key West turtle kraals indirectly contributed to our early understanding of the long-range movements and homing ability of green turtles that first came to light in Archie Carr's (1956) *The Windward Road*. Carr interviewed a number of Cayman Island turtle fishermen who told of turtles they captured and shipped off to markets and later were recaptured at almost the same exact locations of their initial capture after escaping from holding pens. The most compelling evidence was a of 300-pound male green turtle that was recaptured 8 months later under the same coral outcropping on the Nicaraguan Bank. The turtle had been sold to Norberg Thompson, who operated the Turtle Kraals at Key West. Carr was able to match the incident

with a specific October hurricane that destroyed the kraals allowing many turtles to escape. The Cayman fishermen branded their turtles prior to sale. That along with peculiar bite marks on the flippers, allowed the fisherman to unquestionably identify this particular turtle. He later bragged to Carr that he had sold the same turtle twice to Thompson. This turtle traveled 800 miles in straight-line distance from Key West to its place of capture, and based on the placement of Cuba and major oceanic currents, the actual distance traveled would have been much greater. Through such anecdotal information Carr was able to begin to understand the homing and migration abilities of green sea turtles and suggest meaningful conservation programs for the Caribbean stocks.

In 1971 an organization calling itself “Conservation-70s” formed, and as a proponent of environmental concerns addressed the problems facing sea turtles. They recommended that green turtles with carapace lengths under 41 inches should be protected. In March of that year Florida Governor Ruben Askew signed into law an emergency order enforcing this size limit on any green turtle within the state’s jurisdiction. The very day this order was signed the schooner *Adams* arrived at Key West with a load of 135 turtles, only five of which were of legal size. The combination of new regulations and the reduced size of the Caribbean population resulted in the closure of the entire operation (*Miami Herald*, 29 March 1972; *Key West Citizen*, 26 March 1972). Within two years the Endangered Species Act of 1973 listed green turtles as “threatened” and once the actual stock assessments were better understood the species was re-listed as “endangered” in 1978.

By the mid-’70s Key West was in a state of economic flux, while the actual import of turtles was in decline, the fishing boats coming in from Central America and the West Indies continued to make a livelihood. The Caribbean conduits to Key West brought quick cash. The marijuana and cocaine business, as one old Conch observed, was “like shrimping but easier and a lot better paying.” This was a major business that for the most part was ignored for over a decade by the enforcement agencies in the outside world. It all started to unravel 1984 when an F.B.I. agent declared the Key West police department to be “an ongoing criminal enterprise” aiding and abetting a 16-million-dollar smuggling operation. The police chief and 13 others were indicted on 29 June 1984. (Navero, 2011). The populace of Key West has always remained a little on the outside the norms of society, perhaps this is due to its isolation from the mainland, but with the major drug smuggling operations closed down, there was even less of an incentive for fishing boats to venture into international waters.

With the close of the green turtle industry the canneries and kraals fell into disrepair and time and seasonal storms took their toll (Figure 2b). After several decades of dormant interest the site of the abandoned operation was transformed into a museum that explains the key role of the green turtle in the history and culture of the Key West. The waterfront site was excavated like an archeological dig and a number of the artifacts on display were ones recovered from the former kraals. The Turtle Kraals Museum opened its doors to the public in 2009. The remnants of only two kraals remain; a few of the original cement posts

placed in the late 1920s by Thompson Enterprises can be seen from the docks at the museum.

Today gill nets, shrimp trawlers, boat strikes, loss of the turtles’ sea grass foraging sites, oil spills, and beach development contribute to the continued loss of green turtles. The mats of pelagic *Sargassum* that the hatchlings take refuge in during their early months are also declining. Stoner (1983) provides evidence for major declines in the biomass of *Sargassum* in the North Atlantic, Caribbean Sea, and Gulf of Mexico. Between the 1930s and 1980s, there was an overall decline in *Sargassum* biomass attributable to anthropogenic pollutants. Since the 80s there have been a number of attempts to harvest *Sargassum* from the Gulf Stream for use in commercial fertilizer. Increasing numbers of turtles are now affected by fibropapillomatosis, large external tumors that are suspected to be caused by water pollution. There are sea turtle hospitals scattered throughout the world that deal with sick and injured marine turtles, one of them is in the Florida Keys. Turtles come in with every thing from injuries from fishing gear and boat strikes to fibropapilloma tumors. Many with missing appendages, buoyancy problems, and tumors can never be released and will spend their remaining time as captives. While the European and U.S. markets no longer drain the Caribbean stocks, green turtles and their eggs continue to be eaten in a number of West Indian countries and the migratory nature of green turtles makes them vulnerable to man’s activities while protection and enforcement are sometimes minimal and often nonexistent.

The Key West waterfront is now largely dominated by bars, restaurants, and shops displaying local arts and crafts. One of the larger restaurants—with in sight of the museum—is the Turtle Kraals Restaurant and Bar (Figure 6). The end of Margaret Street is a thriving tourist hub and the museum is easily missed, as the small inconspicuous building is lost among the visual clutter and neon glow. Today there are many tourist attractions at Key West—a public aquarium, a butterfly conservatory, several shipwreck and treasure museums, historic buildings to visit, and walking, bus, train and boat sightseeing tours. Sadly, the Turtle Kraals Museum, despite the historic and former economic importance of the industry to the city is not only easily overlooked, it does not even appear on the flyers and tourist attraction guides provided in every restaurant and hotel on the island. If I had not been looking for it, I would not have



Figure 6. Souvenir postcard from the Turtle Kraals Restaurant and Bar (2012).

known it was there. I even asked staff members in several restaurants that were actually in sight of the museum, and one of which was named after the kraals. No one had heard of the museum. One is more likely to come across knowledge of the kraals from looking through antique postcards in the local gift shops than learning of its existence through conventional means. A quick Google search for the kraals leads one through a maze of local businesses that have taken advantage of the name, but not the museum facility itself.

While it is unfair to place our modern-day conservation ethics as they relate to marine turtles on the economic enterprises of our ancestors, with all of today's concerns and the effort required to even partly restore sea turtle populations it is difficult to justify the past exploitation of these creatures and its extension into the present period. Likewise, in the not too distant future people will look back at today's commercial exploitation of reptiles and amphibians for the pet trade with disgust and wonder as why it took so long to control such a vast and unregulated, non-sustainable, international market. As in marine turtle conservation, the money made by a few will be overshadowed by the long-term cost of species restoration efforts. One does not need to read between the lines of text in the exhibit copy at the Turtle Kraals Museum, or study various books on marine turtles, to appreciate the pattern. While the annual number of adult and subadult green turtles coming through the Key West turtle kraals in its heyday seems phenomenal, it pales in comparison to what is currently transpiring with the food market and pet turtle and other reptile trades. The Fish and Wildlife Service reported that 1,594,451 reptiles were imported into the United States in 2003 and the numbers appear to be increasing (U.S. Fish and Wildlife

Service, 2006). While many of these imports represent turtles, the exact number of turtles is not clear. Still the number of turtles exported and imported just from the United States is impressive. Salzberg (1995) estimated that in 1994 the wholesale value of turtles imported and exported from the country amounted to 22 million dollars. Lee and Smith (2010) noted up to 20,000–30,000 Russian tortoises being imported into the US annually and a global market of wild caught tortoises that may be as high as 200,000 exported each year. Solis (2009) reported on thousands of reptiles seized from a single animal dealer in Texas. It is well documented that variations in state and national regulations allow for laundering of turtles through places where laws and lack of enforcement enable the continuing networking of commercial exploitation. The fact that this level of use of turtles is unsustainable is without question, but it appears that we have learned little from well-documented effects of the commercial harvest of green turtles.

Regulatory agencies that continue to refer to our native wildlife as “natural resources” need to begin to rethink their terminology and to appreciate and protect national and international “resources” as much as they do local ones. The Turtle Kraals Museum in Key West provides an historical reminder of an unsustainable former international industry and its role in the devastation of an important species, one where full protection still awaits carefully thought out regulations and firm enforcement. Likewise it serves as a forecast of the long-term harms the commercialization of other reptiles captured from the wild present, and the time and cost that will incur in planned recovery efforts. Like most museums this one is a place to learn of our past, but perhaps more importantly it is also a place where one can reflect and perhaps think ahead.

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Notes on Reproduction of Desert Horned Lizards, *Phrynosoma platyrhinos*
(Squamata: Phrynosomatidae) from Southern California

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Abstract

A histological examination of gonadal material from desert horned lizards, *Phrynosoma platyrhinos*, from California was conducted. Females were reproductively active from March into August. Mean clutch size ($n = 22$) = 6.9 ± 1.8 SD, range = 4–11. The relationship between clutch size and female body size was not significant. There was no evidence females produce multiple clutches. One female from 4 December had commenced yolk deposition, indicating this process may begin in late autumn. The smallest reproductively active female measured 62 mm SVL. Reproductively active males (spermiogenesis in progress) occurred from March to August. The smallest reproductively active male measured 63 mm SVL.

Desert horned lizards, *Phrynosoma platyrhinos* Girard, 1852, range from southwestern Idaho and southeastern Oregon, south to northeastern Baja California and northwestern Sonora, Mexico, where they inhabit arid lands from below sea level to around 1980 m (Stebbins, 2003). The most complete accounts of reproduction in *P. platyrhinos* are in Howard (1974) and Pianka and Parker (1975). Anecdotal information on reproduction of *P. platyrhinos* is in Shaw (1952), Stebbins, (1954, 2003), Tanner and Krogh (1973), Vitt (1977), Behler and King (1979), Lemm (2006), Brennan and Holycross (2009), Brown (2009). The purpose of this note is to provide additional information on the reproductive biology of *P. platyrhinos* based on a histological examination of gonadal material from museum specimens. Utilization of museum specimens for gathering reproductive data has become increasingly important due to the difficulty in justifying monthly collections of lizard samples.

Methods

A sample of 141 *P. platyrhinos* consisting of 70 adult males, (mean snout–vent length, SVL = $75.2 \text{ mm} \pm 6.5$ SD, range = 63–93 mm), 56 adult females, (mean SVL = $78.1 \text{ mm} \pm 6.4$ SD, range = 62–93 mm), 13 juveniles, (mean SVL = $29.7 \text{ mm} \pm 3.6$ SD, range = 24–34 mm) and two recently born juveniles (SVL = 35, 36 mm) was examined from the herpetology collection of the

Natural History Museum of Los Angeles County (LACM), Los Angeles, California, USA. *Phrynosoma platyrhinos* were collected 1914–1989. Specimens examined are listed in the appendix by California county.

A small incision was made in the lower part of the abdomen and the left gonad was removed for histological examination. Gonads were embedded in paraffin and sections were cut at 5 μm , and stained with Harris hematoxylin followed by eosin counterstain (Presnell and Schreiber, 1997). Histology slides were deposited in LACM. Enlarged ovarian follicles (> 4 mm length) or oviductal eggs were counted. An unpaired *t*-test was used to test for differences between male and female SVLs using Instat 3 (Graphpad, San Diego, CA).

Monthly stages in the testicular cycle are in Table 1. Four stages of the testicular cycle were present: (1) regressed, seminiferous tubules are at their smallest sizes and contain spermatogonia and interspersed Sertoli cells; (2) early recrudescence, a proliferation of germ cells for the next period of spermiogenesis is evident as primary spermatocytes are the predominant cell; (3) late recrudescence, the spermatogenic cycle has progressed and secondary spermatocytes and occasional spermatids are present, in addition to spermatogonia and primary spermatocytes; (4) spermiogenesis, lumina of the seminiferous tubules are lined by

Table 1. Monthly stages in the testicular cycle of 70 *Phrynosoma platyrhinos* males from southern California.

Month	<i>n</i>	Regressed	Early Recrudescence	Late Recrudescence	Spermiogenesis
March	5	0	0	2	3
April	25	0	1	0	24
May	25	2	1	0	22
June	11	0	0	0	11
July	2	0	0	0	2
August	2	1	0	0	1

Table 2. Monthly stages in the ovarian cycle of 56 *Phrynosoma platyrhinos* females from southern California.

Month	<i>n</i>	Quiescent	Early yolk deposition	Enlarged Follicles > 4 mm	Oviductal eggs	Corpora lutea
March	1	0	0	1	0	0
April	16	4	7	5	0	0
May	27	5	6	9	4	3
June	4	2	0	1	1	0
July	3	2	0	0	0	1
August	2	1	0	1	0	0
September	2	2	0	0	0	0
December	1	0	1	0	0	0

sperm or clusters of metamorphosing spermatids. The smallest reproductively active males (spermiogenesis in progress) measured 63 mm SVL and were collected in April (LACM 101710, 101718, 149689).

The mean body size (SVL) of my female sample was significantly larger than the mean of my male sample (unpaired *t*-test, $t = 2.6$, $df = 124$, $P = 0.012$). Monthly stages in the ovarian cycle are in Table 2. Five stages were present: (1) quiescent, no yolk deposition in progress; (2) early yolk deposition; (3) enlarged ovarian follicles (> 4 mm); (4) oviductal eggs; (5) corpora lutea from a previous clutch. Females were reproductively active from March into August. Mean clutch size for 22 females was 6.9 ± 1.8 SD, range = 4-11. Linear regression analysis indicated the relationship between clutch size and female size (SVL) was not significant ($r = -0.138$, $P = 0.540$). One female *P. platyrhinos* (LACM 22209) collected 4 December exhibited early yolk deposition (Table 2) and suggests reproductive activity commenced during late autumn. There was no evidence in the form of oviductal eggs and concomitant yolk deposition or corpora lutea and concomitant yolk deposition, in the same female, indicating *P. platyrhinos* females produce multiple clutches in the same reproductive season. The smallest reproductively active female (early yolk deposition) measured 62 mm SVL and was collected in April (LACM 101711). The smallest *P. platyrhinos* examined measured 35 mm SVL (LACM 70221) and 36 mm SVL (LACM 70225) and were collected 23 July and 8 August respectively in San Bernardino County.

Discussion

Despite reports of production of two clutches by *P. platyrhinos* (Howard, 1974; Stebbins, 2003; Brennan and Holycross, 2009), I found no evidence indicating this to occur, even though Fitch (1985) claimed two clutches were normal in the southern part of the *P. platyrhinos* range. Vitt (1977) also found no evidence that *P. platyrhinos* females produced two clutches. The lack of positive correlation between female body size and clutch

size might be due to my samples being collected from different years and localities although Pianka and Parker (1975) reported the correlation between clutch size and body size was weak for this species. My finding of one female from December that had commenced yolk deposition suggests this process begins in late autumn in *P. platyrhinos*. Howard (1974) postulated it must commence by February. My finding of reproductively mature *P. platyrhinos* males of 63 mm SVL is smaller than the 66 mm size for male maturity in this species from southwestern Arizona and northeastern Sonora, Mexico (Howard, 1974). It is also smaller than the smallest mature male *P. platyrhinos* (SVL = 68 mm) from southern Utah (Pianka and Parker, 1975). My smallest mature *P. platyrhinos* female (62 mm SVL) was also smaller than that of Howard (1974) which measured 66 mm SVL and the 70 mm SVL reported by Pianka and Parker (1975). Brown (2009) reported hatchlings of *P. platyrhinos* approximated 25 to 30 mm SVL. Thus, it would appear that my 35, 36 mm SVL juveniles had been active for some time. The clutch size of 6.9, range = 4-11 reported herein, is close to that reported for *P. platyrhinos* in southern Nevada, mean = 6.7 (range 3-9) by Tanner and Krogh (1973).

In conclusion, I found no evidence that *P. platyrhinos* produces multiple clutches in the southern portion of its range. The correlation between female body size and clutch size was not significant and appears to support Pianka and Parker (1975) who indicated this relationship was weak. The minimum sizes for male and female *P. platyrhinos* reproduction reported herein are smaller than those in other studies on this species. My finding of one female from early December that had commenced yolk deposition suggests females begin reproductive activity in late autumn.

Acknowledgment

I thank C. Thacker (LACM) for permission to examine *P. platyrhinos*.

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Appendix

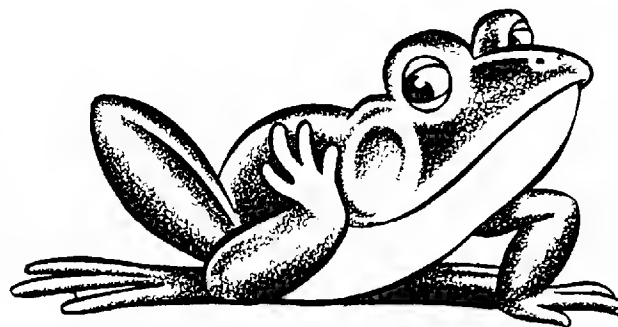
Specimens of *Phrynosoma platyrhinos* from California (by county) examined from the herpetology collection of the Natural History Museum of Los Angeles County (LACM).

California: Imperial County: 4378, 4379, 8870, 26983, 35879, 101602, 126155, 137912, 145546; **Los Angeles County:** LACM 19796, 19797, 19799, 19800, 19803, 19804, 19828, 101622, 115570; **Riverside County:** 4388, 8866, 19808, 28782, 52771, 52773-52777, 52779-52781, 101603, 101625-101628, 101630-101633, 101635, 101637, 101639, 101640, 101641, 101644, 101647, 101648, 101650-101654, 101660-101662, 101668, 101673, 101674, 101680, 101681, 101688, 101691, 101695, 101696, 101700, 101703, 101705, 101708, 149680, 149689, 22209; **San Bernardino County:** LACM 19783, 19790, 19793, 19794, 21900, 36598, 52767, 63989-63991, 67732, 70213, 70214-70219, 70221, 70223, 70225, 74196, 19792, 101629, 101642, 101656-101658, 101667, 101670, 101679, 101687, 101706, 101709-101711, 101715, 101717, 101718, 101722, 101727, 101728, 101730, 101732, 101734, 101736, 101737, 101741, 101744, 101746-101748, 101750, 101751, 101753, 101755-101758, 115571, 115576, 122428, 122429, 123349, 125980, 149687; **San Diego County:** LACM 19797, 101477, 101480.

The Tympanum

It has been a pleasure to read in your past bulletins the excellent articles and book reviews by David and Tracy Barker discussing the controversies brought about by Burmese pythons in the Florida Everglades. The Barkers provide your readers detailed factual analysis of the ways some individuals utilize inaccurate information to support questionable conclusions that benefit those individuals in some manner.

As the Barkers so accurately warned, this faulty “science” has



now resulted in federal rulings that are unfair to reptile owners and do not effectively solve the “python problem.”

The use of questionable and self-serving information as documented in detail by the Barkers should be an eye-opening warning lesson to your readers.

Thank you again for printing the timely and valuable articles about this subject by David and Tracy Barker. **Paul Breese, PO Box 1049, Kapaau HI 96755.**

Unofficial Minutes of the CHS Board Meeting, June 15, 2012

The meeting was called to order at 7:45 P.M. at the Schaumburg Public Library. Board members Mike Dloogatch, Jim Foster, Jason Hood, Nancy Kloskowski and Jenny Vollman were present. This did not constitute a quorum.

Officers' Reports

Recording Secretary: The minutes of the May 18, 2012, board meeting were read.

Treasurer: The financial reports for May were discussed.

Membership Secretary: The current count stands at 510.

Sergeant-at-arms: Jim Foster reported that attendance at the May general meeting was 48

Committee Reports

Shows:

- Notebaert, first full weekend of each month. Josh Chernoff is coordinator.
- Rockin' for the Reptiles, Midwest Museum of Natural History, Sycamore, June 30. Dick is looking for volunteers.
- Museum of Science and Industry Member's Night, July 25. Jenny Vollman will coordinate this event.
- SEWERfest, August 5, 10–3. They donate a table to the CHS.

ReptileFest 2013: The dates have been confirmed—April 13-14, 2013. This will be the 20th anniversary!

Old Business

Junior Herper Club: Some questions need to be looked at regarding the Junior Herpers. What are our goals for this club? What kind of budget should be allotted? What steps should be taken in starting this group? Possible goals or mission statement: proper husbandry, conservation, education. These questions need to be answered before starting the group. Adults who will be leading or helping with meetings or events need to be trained. Meetings could possibly be held at the Notebaert Nature Museum on the 1st Sunday of the month.

National Herpetological Society: Jason Hood has been involved and reports that the organization is starting to come together.

Conservation donations: Dupage County Forest Preserve District needs funding for Blanding's turtle conservation. The massasauga workers at Carlyle Lake need equipment for housing and care of fungus-infected snakes. Jason will look at possible donations of equipment before discussion of dollar amounts.

Bulletin printing: Mike has been looking into reducing our printing costs. He received a lower quote from another printer. Our current printer can match this price, with no loss of quality.

New Business

Snapperfest: Rob Carmichael has brought Snapperfest in Ohio county, Indiana, to our attention. He would like to explore possible action against this event. Many snapping turtles are removed from the wild and treated very badly. If an appropriate action can be decided on, the CHS would likely support it.

Round Table

Mike Dloogatch mentioned that the CHS has received a review copy of a new book on the amphibians and reptiles of Michigan by Alan Holman – it looks like a good book.

Dick Buchholz went herping in Kentucky and learned that a “cowsucker” is an eastern milksnake.

Jason Hood took visiting scholar Gunther Köhler herping in Wisconsin.

The meeting was adjourned at 9:00 P.M.

Respectfully submitted by Jenny Vollman



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Herpetology 2012

In this column the editorial staff presents short abstracts of herpetological articles we have found of interest. This is not an attempt to summarize all of the research papers being published; it is an attempt to increase the reader's awareness of what herpetologists have been doing and publishing. The editor assumes full responsibility for any errors or misleading statements.

RED-BELLIED SNAKES IN ILLINOIS

L. E. Brown and C. A. Phillips [2012, Illinois Natural History Survey Bulletin 39(5):297-322] report that the examination of 387 preserved red-bellied snakes, *Storeria occipitomaculata*, from 18 museums and collections, literature records, and unpublished records have revealed distributional records throughout much of Illinois, in contrast to earlier studies which found a more limited distribution. Seventy-one records of habitat types from museum records, field notes, and literature indicated that the species occupies woodlands but is not primarily forest adapted. It also inhabits prairie and prairielike habitats in Illinois. The common occurrence of this species in this type of habitat has not heretofore been reported elsewhere in the range of the snake. These findings do not support an older zoogeographic theory that assumed the snake was nonadapted for prairie and thus excluded from the Prairie Peninsula. The authors propose that the species was able to occupy the area near the ice rim of the Wisconsin Episode glaciation, and followed the glaciation as it retreated because of the snake's cold tolerance, ability to inhabit northern prairies and coniferous forests, vivipary which allows thermoregulation by gravid females, and the relatively temperate climate along the glacial rim. Within recent times, it seems likely that the snake was extirpated throughout much of the former prairie by destructive changes associated with agriculture.

DIET OF THE RED DIAMOND RATTLESNAKE

E. A. Dugan and W. K. Hayes [2012, Herpetologica 68(2):203-217] describe the diet of the red diamond rattlesnake (*Crotalus ruber*) using data collected from museum specimens, live specimens from a field study, road kills, opportunistic behavioral observations, and existing literature. Dietary samples were collected from across the species' range, including Southern California (USA) and Baja Norte and Baja Sur (Mexico). Examination of 272 individuals resulted in 227 prey items recorded from 219 snakes. The diet of *C. ruber* consisted largely of mammals (91.6%), but also included lizards (7.5%) and birds (0.9%). No ontogenetic shift in prey type was evident, with mammals consumed by all snake size classes. However, adults fed on larger prey than juveniles. Sexual dimorphism existed in snake length, with adult males averaging longer than adult females. Juvenile males consumed larger prey than females, but no sexual differences in prey mass existed for adults when controlling for snake body length. Snakes from coastal populations averaged longer in body length than snakes from desert populations. Coastal snakes consumed a higher proportion of rodents, and prey of larger body mass when controlling for snake length, than snakes from desert populations. The presence of prey was independent of snake collection month, suggesting year-round feeding, as supported by observations of occasional winter feeding by snakes in California. Although *C. ruber* may scavenge food opportunistically, behavioral observations suggest that it relies heavily on ambushing mammal prey.

RELEASE OF CAPTIVE-REARED HELLBENDERS

C. M. Bodinof et al. [2012, Herpetologica 68(2):160-173] monitored movements of 36 captive-reared Ozark hellbenders (*Cryptobranchus alleganiensis bishopi*) released to augment wild populations at two sites on the North Fork of the White River (Missouri, USA). Radiotelemetry was used to collect 3610 hellbender locations from May 2008 to August 2009. The authors quantified movements at multiple spatio-temporal scales and made comparisons between two seasons of monitoring (1 = release–December 2008; 2 = January 2009–August 2009). At the finest (daily) scale, most hellbenders (90%–94% per season) were highly sedentary ($\geq 50\%$ of observations indicated no movement). Typical distances between daily locations when hellbenders moved were < 5 m in Season 1 (median = 3.08 m, $n = 331$; range = 0.19–903.00) and < 2 m in Season 2 (median = 1.80 m; $n = 161$; range = 0.21–34.00). During the study hellbenders rarely (35 of 492 movements) traveled > 20 m between daily locations, and virtually all (34 of 35) such movements occurred in Season 1. At a broader scale, home ranges of hellbenders varied widely in Season 1 (range = 0.66–986.92 m², $n = 26$), but in Season 2 averaged only 31.33 m² (± 11.81 SE, $n = 8$) and 11.08 m² (± 3.25 SE, $n = 7$) at respective sites. Among hellbenders monitored long enough to exhibit settlement (estimation of a home range) 69% (18 of 26) dispersed ≤ 50 m from the point of release. The authors only noted mortality associated with dispersals > 50 m at one site, when it coincided with abandonment of core habitat that was one-third as large as at the other site. At the broadest scale, 68% and 86% of hellbenders settled in core habitat of respective release sites, and most had settled within 21 d postrelease (range = 0–49 d). Collectively, hellbender movements indicated a short period of exploration followed by more permanent settlement and high site fidelity typical of wild conspecifics. Captive-reared juvenile hellbenders may be well suited for translocation; however, the quality of habitat at fine scale (10–30 m²) and the extent of suitable habitat within release sites are important considerations.

DIETS OF NEOTROPICAL GOO-EATING SNAKES

J. M. Ray et al. [2012, Copeia 2012(2):197-202] describe the diet composition of six species of dipsadines (*Sibon longifrenis*, *S. argus*, *S. annulatus*, *S. nebulatus*, *Dipsas nicholsi*, *Dipsas* sp.) from two montane forest sites in central Panama. Between 2005 and 2007 we captured 473 individual snakes, of which 305 contained no prey and two contained gut contents. Of the 166 fecal samples collected, 41 had no identifiable prey and 125 contained identifiable prey. We analyzed fecal samples and found that dipsadines at our study sites feed on mollusks, annelids, and amphibian eggs. None of the six species examined feed exclusively on mollusks, although most do feed on a variety of soft-bodied prey. *Dipsas* feeds extensively on earthworms, *S. annulatus* feeds on mollusks and earthworms, and *S. longifrenis* and *S. argus* feed heavily on amphibian eggs when available.

TADPOLE PERFORMANCE

J. S. Cohen et al. [2012, J. Herpetology 46(1):85-90] note that terrestrial plant litter is an important subsidy to freshwater ecosystems, where it serves as a basal resource in benthic food webs. Litter quantity and decomposition rate strongly influence energy flow through these food webs. Litter quantity often increases following nonnative plant invasions, but the impact this additional litter has on aquatic consumers is largely unknown. The authors conducted an experiment in outdoor microcosms containing plant litter, microbes, algae, and tadpoles. Many tadpoles feed on biofilms (bacteria, fungi, and algae) that develop during decomposition; as such, they are ideal organisms to test bottom-up effects of litter subsidies. The authors used a related pair of native and nonnative wetland grasses to investigate whether litter quantity affects tadpole performance. Tadpole performance metrics (developmental stage, size, and survival) showed significant positive responses to increased litter quantity but were mostly unaffected by plant species. Therefore, litter quantity was the primary determinant of tadpole performance in the experimental community. The authors suggest that changes to litter quantity can have important impacts on larval amphibians.

SMALLEST KNOWN HERBIVOROUS REPTILE

M. S. Valdecantos et al. [2012, Copeia 2012(2):203-210] report that a small, cold-climate lizard from the Andes of Argentina, *Liolaemus poecilochromus*, is primarily herbivorous (>80% plants in diet). This is true even for juveniles, making them the smallest herbivorous reptiles known. The authors detected relatively few differences in diet between the sexes, despite male-biased sexual dimorphism in head and body size. Adults consumed more mites and flowers than juveniles, and a weak ontogenetic shift from omnivory to herbivory was detected that is attributable to the lower volumetric consumption of plants by juvenile males. The paper discusses the abiotic and biotic conditions that likely selected for herbivory in this and other small-bodied, high-elevation *Liolaemus*.

ESCAPE BEHAVIOR OF ANOLES

Z. M. Jones and B. C. Jayne [2012, J. Herpetology 46(1):5155] quantified the effects of auditory stimuli on locomotor performance during the escape responses of two species of arboreal lizard, *Anolis sagrei* and *Anolis carolinensis*, with two different groups per each species, that were either long-term captives or recently caught. Other than presence or absence of a loud sound, conventional methods were used for handling the lizards and eliciting an escape. For both species and times in captivity, the addition of a loud sound significantly increased the escape running speed, in part by decreasing the amount of pausing. Although the trends were similar for recently caught individuals and long-term captives, the magnitude of the effect of the loud sounds was less for the recently caught individuals. *Anolis sagrei* was faster than *A. carolinensis* regardless of the stimulus, and the rank order of individuals based on performance within each experimental group and species did not change significantly with different auditory stimuli. Results of this study suggest the auditory system may be important for detecting and evading threats despite the lack of vocalization in these lizards.

DESERT TORTOISES IN WIND FARMS

J. R. Ennen et al. [2012, Copeia 2012(2):222-228] investigated the annual nesting ecology of a population of desert tortoises (*Gopherus agassizii*) inhabiting a utility-scale renewable energy (USRE) facility in southern California and compared the results with populations inhabiting relatively undisturbed sites. In 2000, 15 radio-tracked females produced 29 clutches, and 24 nests were monitored to examine nest-site selection, nest predation, hatching success, date of emergence of hatchlings, and hatchling mass and carapace length. Overall, the nesting ecology of the population inhabiting the USRE facility was very similar to other populations of desert tortoises inhabiting relatively undisturbed habitats. Oviposition occurred from 12 May to 8 July, which was similar to other sites. Nest depths (11.1 cm), nest predation (12%), hatchling emergence date (7 August and 29 September), and hatchling morphometrics (i.e., midline carapace length: 44.5 mm; mass: 23 g) were all within ranges reported in other populations. Unlike within other populations, no relationship was seen between hatchling size and either maternal body size or egg width. No evidence was found of females selecting for a particular burrow for oviposition of eggs based on environmental or anthropogenic variables. Most nests were located in or near burrows, and nest depth was greater for nests near the entrance than those deeper in the burrow. Although this study suggests that the nesting ecology of the desert tortoise population studied was not adversely affected by the USRE facility, this relationship is only correlative because the study was not a before-after-control-impact (BACI) study, which would establish a cause and effect relationship. As pointed out in a recent review, BACI studies are critically needed to address the wildlife impacts of utility-scale renewable energy development.

USE OF UNDER-ROAD TUNNELS BY LONG-TOED SALAMANDERS

K. S. Pagnucco et al. [2012, Copeia 2012(2):331-340] note that Linnet Lake (Waterton Lakes National Park, Alberta, Canada) is the breeding site of a population of long-toed salamanders (*Ambystoma macrodactylum*) that has decreased dramatically over the last 15 years, partially due to vehicle-caused mortality occurring on an adjacent road. In May 2008, Parks Canada installed four amphibian tunnels under this road. Drift fences were installed to direct salamanders toward tunnel entrances and tunnel use was monitored with pitfall traps in 2008 and 2009. Salamander road mortality decreased from 10% of the population to <2% following installation of tunnels and fences. In 2009, 104 salamanders were documented using tunnels. Salamanders were 20 times more likely to use tunnels when traveling to the breeding site than when leaving the site. Distance from tunnel entrances, sex, and body size did not have significant effects on tunnel use by salamanders. Although salamander movement was positively correlated with occurrence of precipitation, this relationship was much stronger when salamanders were leaving the breeding site. Variation in use between the four tunnels was positively correlated with soil moisture of surrounding habitat. Continued monitoring will be needed to determine if tunnel use by long-toed salamanders increases through time, and if decreased road mortality translates into population gains.

ABNORMALITIES IN CANADIAN FROGS

C. D. Roberts and T. E. Dickinson [2012, Canadian Journal of Zoology 90(7):808-814] note that a parasitic flatworm (*Ribeiroia ondatrae*) is known to cause severe limb abnormalities and high mortality levels in American amphibian populations. The distributional pattern of this parasite—its main dispersal agent being birds—correlates with the boundaries of migratory flyways in the USA. Yet thus far, *R. ondatrae* have not been found in Canadian amphibians, which is surprising, considering that said flyways extend well into northern Canada. This study reports on a lake in British Columbia that is known to support amphibians with abnormalities similar to those induced by *R. ondatrae*. To determine if the parasite was present and if it was the cause of the abnormalities, the authors collected and necropsied metamorphs of the Columbia spotted frog (*Rana luteiventris*) and the Pacific chorus frog (*Pseudacris regilla*), and set up field enclosures to protect larvae from *R. ondatrae*. Abnormality levels were high in both species (>20%), with the vast majority being found in close proximity to the metacercariae of *R. ondatrae*. Moreover, the types of abnormalities closely matched those previously recorded in field and laboratory exposures of amphibians to *R. ondatrae*. Finally, larvae that developed in the same lake, but were protected from *R. ondatrae* by an enclosure, did not develop abnormalities. Collectively, these results demonstrate that *R. ondatrae* are both present in an amphibian community in Canada and responsible for causing limb abnormalities.

EFFECTS OF INTRODUCED MAMMALS ON A NATIVE GECKO

C. D. Knox et al. [2012, J. Herpetology 46(2):145-152] examined relationships between livestock grazing and the activity of introduced rodents and population density of jeweled geckos, *Naultinus gemmeus* (Diplodactylidae) on the Otago Peninsula, South Island, New Zealand. It was expected that livestock grazing would prevent the proliferation of rank grass (which is often associated with high rodent densities) and thereby reduce the frequency of predation by rodents on jeweled geckos. Thus, the authors predicted activity of rodents to be lower, and density of jeweled geckos higher, at sites grazed by livestock. This was tested for two habitats: *Coprosma* spp. shrubland and regenerating kanuka (*Kunzea ericoides*) forest. Density of jeweled geckos was quantified using visual searches, photography and mark-recapture. Tracking tunnel surveys were used to estimate the activity of introduced rodents. The activity of rodents (*Rattus* spp. and *Mus musculus*) was significantly higher at ungrazed compared to grazed sites in both habitats. Density of jeweled geckos in *Coprosma* was over four times higher at grazed sites and decreased with increasing rodent activity, however, in kanuka, density was significantly higher at the ungrazed sites. The authors infer that in ungrazed *Coprosma*, rank grasses support high rodent densities and, consequently, high predation of jeweled geckos. Thus, grazing by introduced livestock may promote the survival of jeweled geckos and the persistence of high density populations in *Coprosma* shrubland. In contrast, grazing in regenerating kanuka may impact on jeweled geckos negatively, possibly by removing thermal refugia.

ECOLOGY OF EASTERN FOXSNAKES

J. R. Row et al. [2012, J. Herpetology 46(1):94-99] note that determining how animals respond to habitat loss and fragmentation requires detailed studies of habitat use and behavior in regions that vary in their degree of fragmentation. As predators, snakes are an important component of ecosystems, yet little is known about how they respond behaviorally to habitat loss. Using radiotelemetry at two locations that differ in their habitat patch size, The authors examined habitat-use patterns at two spatial scales and movement patterns for the endangered eastern foxsnake (*Pantherophis gloydi*). Movement patterns were similar at the two locations, but individuals exhibited greater variation in home-range size, and males and gravid females dispersed further from hibernation sites within the larger natural habitat patch. Individuals from both locations preferred marsh at the home-range scale, but open dry habitat at the location scale. Within the smaller habitat patch, however, these preferences were accentuated with snakes avoiding agricultural fields. At the landscape scale, individual occurrence records were found closer to, and in areas with a higher density of, usable habitat than locations that are distributed randomly.

BULLSNAKE–FOXSNAKE HYBRIDS

J. B. LeClere et al. [2012, J. Herpetology 46(2):257-262] describe two intergeneric hybrid snakes (*Pituophis catenifer sayi* × *Pantherophis vulpinus*) from the Midwestern United States; one collected in south central Iowa and the other from southeastern Minnesota. Both specimens are morphologically intermediate between the putative parental species *P. c. sayi* and *P. vulpinus*. Hybrid origin was verified by comparing DNA sequence data from the hybrids to the putative parental species. Both hybrid specimens possessed *P. c. sayi* mitochondrial DNA haplotypes. Examination of the nuclear gene Vimentin (intron 5) showed both specimens were heterozygous at most variable sites confirming their hybrid origin. These snakes represent only the second and third confirmed instances of naturally occurring intergeneric hybridization among squamate reptile species.

REDISCOVERY OF A RARE SEA SNAKE

A. R. Rasmussen et al. [2012, Copeia 2012(2):276-282] report that Smith's small-headed sea snake, *Hydrophis parviceps*, was originally described in 1935 from a single type specimen collected in southern Vietnam. Since this time there has been only one further record for the species—a specimen collected near the type locality in 1960 that has since been lost. Through field surveys in southern Vietnam in 2001, the authors obtained three additional specimens of this poorly known sea snake from fisheries bycatch. This paper includes morphological and molecular data for the three new specimens and the holotype, and redescribes *H. parviceps* based on data synthesized for all five specimens known to date. The authors also discuss the conservation status of the species based on its vulnerability to fisheries bycatch mortality and seemingly low abundance within a very restricted geographic distribution.

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UPCOMING MEETINGS

The next meeting of the Chicago Herpetological Society will be held at 7:30 P.M., Wednesday, June 27, at the Peggy Notebaert Nature Museum, Cannon Drive and Fullerton Parkway, in Chicago. **Bryan Suson**, a freelance ecologist from Libertyville, Illinois, will speak on “Ecuador: Biodiversity in the New World Tropics.” Bryan was gracious enough to respond affirmatively to a last-minute invitation when our previously scheduled speaker canceled. He has spent many months in Ecuador and has many spectacular photographs to share with us.

At the August 29 meeting **Roger Repp** of Tucson, Arizona, will present “Burrow Buddies — or Not? (What’s up with That?).” This program deals with desert herp species that den communally. Roger spent his formative years in the Chicago suburbs. He came out of his mother’s womb a herpetologist, but the formation of the Chicago Herpetological Society was the catalyst for a lifelong passion for our crawly friends. By profession, he is Instrument Shop Supervisor for the National Optical Astronomy Observatory. By avocation, he is a rabid field herpetologist who has averaged 800 field hours per year in Arizona since 1989.

The regular monthly meetings of the Chicago Herpetological Society take place at Chicago’s newest museum—the **Peggy Notebaert Nature Museum**. This beautiful building is at Fullerton Parkway and Cannon Drive, directly across Fullerton from the Lincoln Park Zoo. Meetings are held the last Wednesday of each month, from 7:30 P.M. through 9:30 P.M. Parking is free on Cannon Drive. A plethora of CTA buses stop nearby.

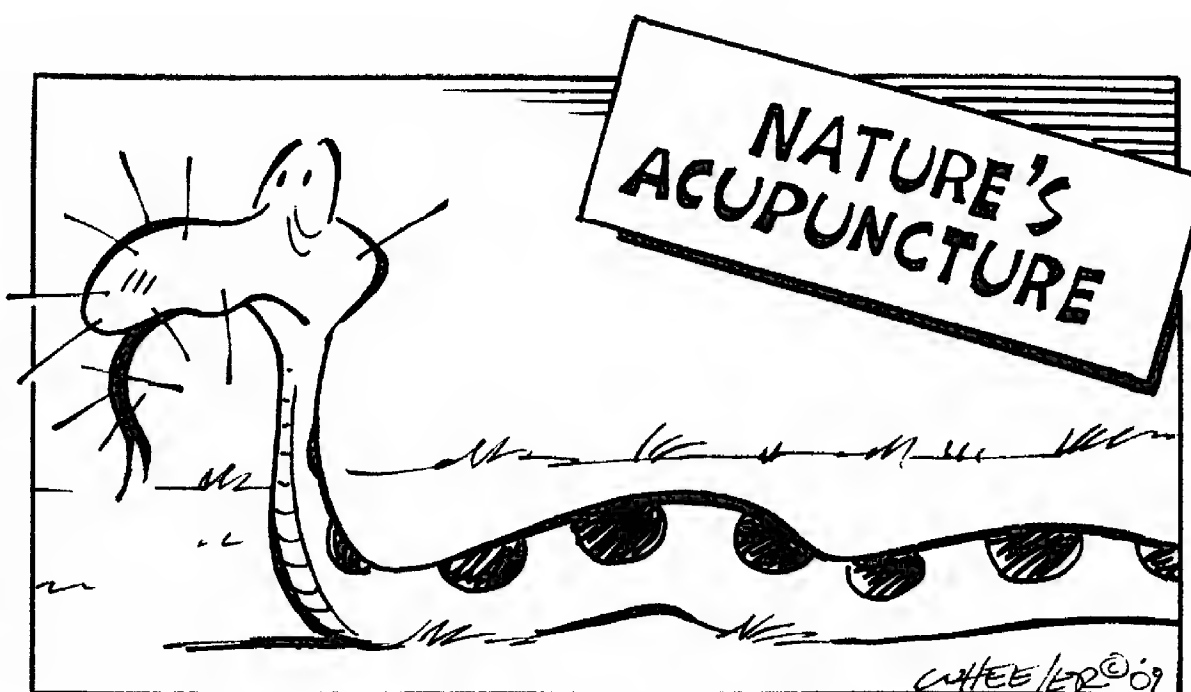
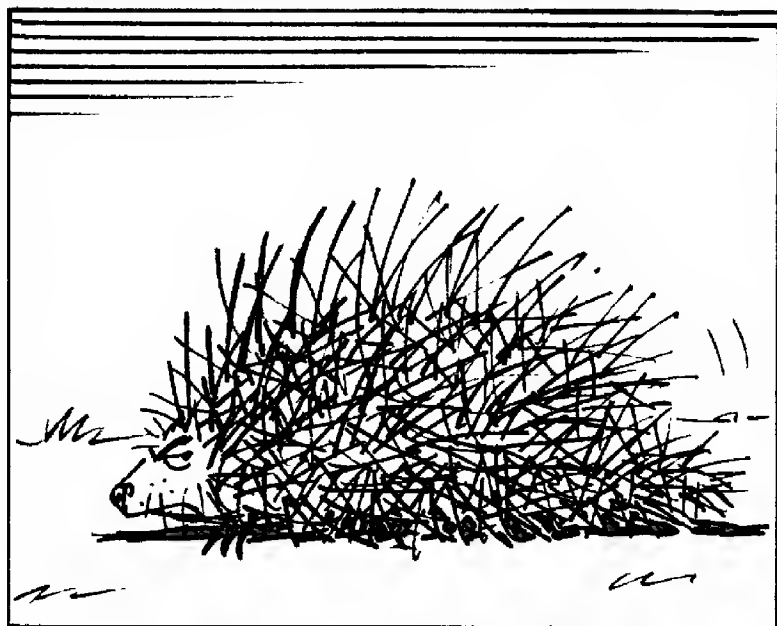
Board of Directors Meeting

Are you interested in how the decisions are made that determine how the Chicago Herpetological Society runs? And would you like to have input into those decisions? If so, mark your calendar for the next board meeting, to be held at 7:30 P.M., August 17, in the adult meeting room on the second floor of the Schaumburg Township District Library, 130 S. Roselle Road, Schaumburg.

The Chicago Turtle Club

The monthly meetings of the Chicago Turtle Club are informal; questions, children and animals are welcome. Meetings normally take place at the North Park Village Nature Center, 5801 N. Pulaski, in Chicago. Parking is free. For more info visit the group’s Facebook page.

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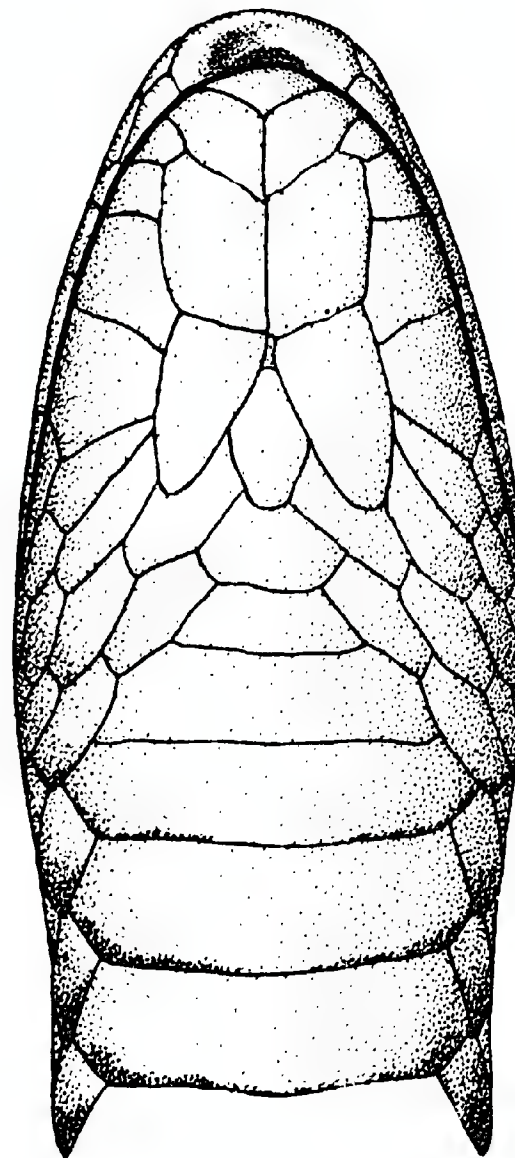
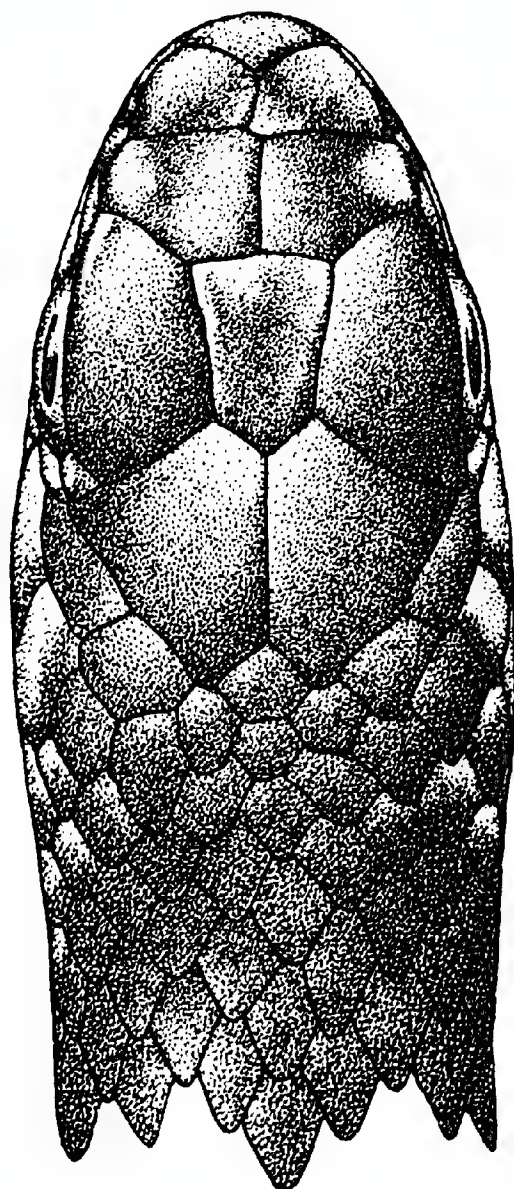
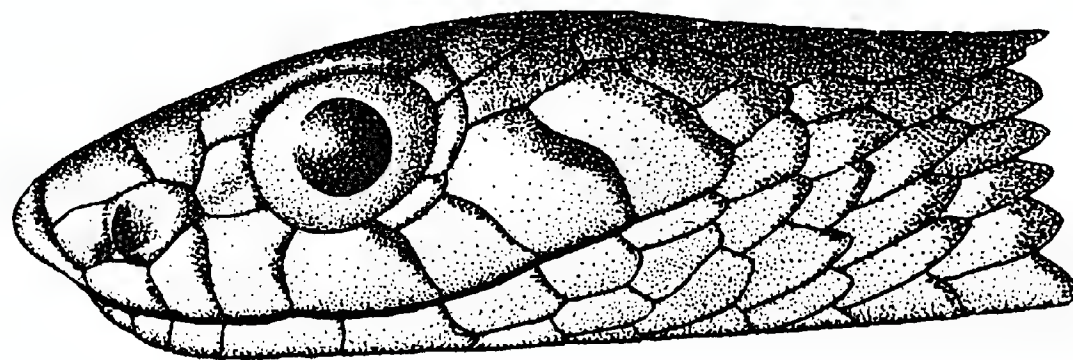
BULLETIN

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BULLETIN OF THE CHICAGO HERPETOLOGICAL SOCIETY

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A Note on the Diet of Common Garter Snakes, <i>Thamnophis sirtalis</i> , in Pennsylvania	Brian S. Gray	97
Book Review: <i>The Amphibians and Reptiles of Michigan: A Quaternary and Recent Faunal Adventure</i> by J. Alan Holman	John G. Palis	99
What You Missed at the July Meeting	John Archer	102
Herpetology 2012		106
Unofficial Minutes of the CHS Board Meeting, July 13, 2012		107
Advertisements		108

Cover: Gold's tree cobra, *Pseudohaje goldii*. Drawing from *Genera des Serpents du Congo et du Ruanda-Urundi* by Gaston-François de Witte, Musee Royal de l'Afrique Centrale — Tervuren, Belgium. Annales — Serie in 8° — Sciences Zoologiques — No. 104, 1962.

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A Note on the Diet of Common Garter Snakes, *Thamnophis sirtalis*, in Pennsylvania

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Common garter snakes, *Thamnophis sirtalis*, are generalized predators that include a wide variety of prey in their diet. In Pennsylvania, prey items include earthworms, anurans, salamanders, birds and small mammals (Surface, 1906; Hulse et al., 2001). In addition to live prey, carrion in the form of dead amphibians or birds (Figure 1) may also be consumed (Gray, 2002). Salamander species listed as being consumed by Pennsylvania *T. sirtalis* include northern redback salamanders, *Plethodon cinereus*, and northern slimy salamanders, *P. glutinosus* (Surface, 1906). Herein, I report an ambystomid salamander in the diet of a *T. sirtalis* from Erie County, Pennsylvania.

On 2 July 2012, ca. 1940 h, at a site just north of the Conrail tracks along the Highway 832 bridge in Erie County, Pennsylvania, I found a male *T. sirtalis* (380 mm SVL, 500 mm total length, 36 g. mass) under a large piece of corrugated cardboard. The snake was coiled and had a surface temperature of 23.4°C; air temperature was 27.0°C. The surface temperature of the snake was obtained with a noncontact infrared thermometer



Figure 1. A common garter snake, *Thamnophis sirtalis*, from Erie, Pennsylvania, found 28 July 1998. The snake disgorged the bird limbs upon being handled. It was determined that the bird limbs were previously consumed as carrion.



Figure 2. Partially digested spotted salamander, *Ambystoma maculatum*, disgorged by a common garter snake, *Thamnophis sirtalis*, from Erie, Pennsylvania, that was found 2 July 2012.

(Raytec MiniTemp MT 6). The snake had an obvious bulge at midbody suggesting a recent meal. Upon handling the snake, it disgorged a partially digested spotted salamander, *Ambystoma maculatum* (118.7 mm total length, 11 g mass) (Figure 2). The ratio of prey mass to snake mass was 0.31.

Based on the orientation of the salamander when disgorged (head first), it must have been consumed tail end first. On the dorsal surface of the body and tail of *A. maculatum* are numerous granular glands that produce noxious alkaloid secretions (Figure 3) that reportedly repulse attacks by some mammals, birds and reptiles (Petranka, 1998; Vitt and Caldwell, 2009). The secretions of these glands are described as neurotoxic (Vitt and Caldwell, 2009). Minton (2001), upon touching some to his tongue, experienced an astringent taste followed by tingling and numbness. Apparently, *T. sirtalis* is not thwarted by these secretions. Common garter snakes are also known to prey on Ameri-



Figure 3. Dorsal skin secretions on the tail of a spotted salamander, *Ambystoma maculatum*.

can toads, *Anaxyrus americanus*, which also produce toxic skin secretions as a defensive measure. Incidentally, the author once had a captive male *T. sirtalis* that consumed a red eft, *Noto-phthalmus viridescens*, without any noticeable ill effects. The skin of the red eft contains tetrodotoxin which can be lethal if ingested (Minton, 2001).

At the time of the above observation the slope along the bridge was very dry and a significant portion of the flora (e.g. crown vetch, *Coronilla varia*, and goldenrod, *Solidago* sp.) was beginning to wilt. As of 2 July 2012 the region had only received 15.10 inches of precipitation, 3.84 inches below the

normal average seasonal accumulation of 18.94 in. Even in adjacent swamp forest the substrate was dry in most places. Therefore, it is unlikely that the spotted salamander was consumed while moving about on the surface. Rather, it was likely consumed in a retreat under some sort of cover object. *A. maculatum* were last observed by the author on the slope of the bridge 1 May 2012.

Although *T. sirtalis* has been reported to consume *A. maculatum* (Ernst and Ernst, 2003), I believe this to be the first record of a Pennsylvania specimen doing so.

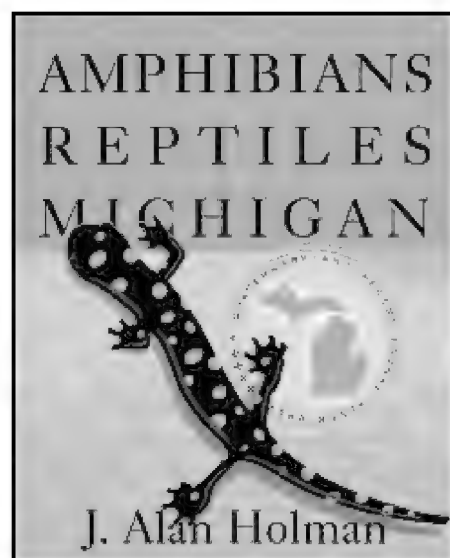
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Book Review: *The Amphibians and Reptiles of Michigan: A Quaternary and Recent Faunal Adventure* by J. Alan Holman. 2012. 312 pp., 165 illustrations. Wayne State University Press, Detroit, Michigan. ISBN 978-0-8143-3239-9. Hardcover. \$50.00

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A comprehensive statewide treatment of Michigan's entire herpetofauna had not been attempted since the early 1900s (Ruthven et al., 1912; 1928). Wayne State University Press resolved this situation by publishing J. Alan Holman's *Amphibians and Reptiles of Michigan* in May 2012. This welcome update to the outdated work of Ruthven and colleagues almost did not happen.



A Publisher's Note preceding the Table of Contents informs the reader that Holman "died suddenly just days after turning in his manuscript to the press." Holman died of a heart attack on 12 August 2006 after a long and productive career, principally as a paleoherpetologist (Harding, 2006). Fortunately for students of Michigan and midwestern herpetology, Holman's friends and colleagues—James Harding, James Gillingham and David Mifsud—saw the manuscript through publication. These gentlemen are to be commended for generously sharing their time and expertise with the Press.

This attractive (a stylized image of a spotted salamander graces the front cover) and well-constructed book is divided into three main parts: 1) Introduction, 2) Species Accounts, and—a unique feature of this book—3) a summary of the Michigan herpetological fauna in Quaternary and recent historical times. These sections are followed by references cited (by my count, nine citations are CHS *Bulletin* articles), a general index, a taxonomic index, and a site index of fossil and archaeological sites.

In the Introduction, Holman describes Michigan in a manner that never occurred to me, as "two large peninsulas that penetrate large inland freshwater seas" (Michigan borders four of the five Great Lakes). He introduces the reader to Michigan geological history and points out that today's herpetofauna recolonized following the retreat of the last glacier, which covered the entire state in mile-high ice for thousands of years. He goes on to describe landscape changes wrought by Euro-Americans and introduces Michigan's four regional landscape ecosystems. Holman follows with descriptions of "modern herpetological habitats," including terrestrial and aquatic natural communities as well as urban settings. In the latter section, Holman describes the reduction in herpetofaunal diversity in his own backyard between 1967 and 1977, and suggests a similarly diminished herpetofauna now occurs across the eastern third of the United States. A chronological "who's who" in Michigan herpetological history follows, as does a discussion of amphibian and

reptile collection procedures and identification. A unique feature of the identification section is Holman's treatise on identifying amphibian and reptile bones and bone fragments. For up-to-date collection and possession regulations, Holman directs the reader to the *Michigan Fishing Guide* published annually by the Michigan Department of Natural Resources.

Figure 1 in the Introduction is a small (about one-third of the left-hand column of one page) map of Michigan depicting each county and three large islands. The typeface used for the county names is tiny, and the letters are so crowded together that the names are impossible to read, even when examined with a 10× hand lens. This is particularly unfortunate as Holman often refers to particular counties throughout the book. Fortunately for the reader, another small map of Michigan showing county names (and the four regional landscape ecosystems) appears eight pages later in the Introduction. County names on that map are more legible; however, given their small size I believe the reader would be well served to slip into the book a larger map of Michigan on which the county names are more readable.

Species accounts comprise the bulk of the book. Here, Holman provides detailed information for all 54 of Michigan's amphibians and reptiles. Each account includes a color photograph, a small Michigan range map, and topic headings that include identification (I like the inclusion of both metric and English measurements), general and Michigan distribution, geographic variation, habits and habitats, reproduction and growth (frog calls are described here or in the identification section), diet, predation and defense, interaction with humans, behavioral characteristics, population health, and general remarks. Several amphibian accounts also include drawings from Clifford H. Pope's (1944) classic, *Amphibians and Reptiles of the Chicago Area*.

At the beginning of the Species Accounts section, Holman shares the sources he uses for taxonomic arrangements. For scientific names (i.e., genus, species, subspecies), for example, he generally follows Crother (2008). However, he notes that "taxonomic placement and scientific names of amphibians and reptiles are presently quite unstable" and that "new arrangements of relationships are proposed on an almost daily basis." So, in cases where recent proposed changes "remain controversial," Holman retains "more familiar and traditional nomenclature." For example, instead of following Frost et al. (2006) and using *Anaxyrus* for toads, and *Lithobates* for true frogs, he uses the familiar generic designations *Bufo* and *Rana*. I greatly appreciate his cautious approach to these recent taxonomic changes (see Holman, 2006).

The book lacks a dichotomous key and Holman (in the

Introduction) directs the reader to identify amphibians and reptiles by looking “at the pictures until you find the species that most closely matches your specimen.” Each species is depicted by a single color photograph. Given the relatively depauperate herpetofauna of Michigan, examination of the photographs alone will generally serve to identify most species. For some groups or species, however, additional photographs or drawings would have greatly enhanced the reader’s ability to identify Michigan’s amphibians and reptiles. For example, the inclusion of larval amphibian images would have provided the reader with a resource for identifying the life stage that, for some species (e.g., mole salamanders), is more likely to be encountered than the adult stage. Holman does provide written descriptions of amphibian larvae, but nothing replaces a good photograph. Photographs of juvenile snakes that differ markedly from adults (e.g., blue racer, central ratsnake) would also have made the book more useful to the novice herpetophile. A few salamander photographs (four-toed salamander, in particular) are dark and may make identification by photograph a challenge. In some cases (e.g., common watersnake), the image is of an animal that is too distant to see it clearly. In general, however, the photographs are high-quality and sufficient for identification.

I noticed a few omissions/errors in the identification sections of species accounts that could have been addressed with more careful pre-publication editing. In relatively few accounts, for example, does Holman discuss how to distinguish males from females. In some snake accounts, certain identifying characters such as whether scales are keeled or smooth (e.g., blue racer, northern ribbonsnake) or whether the anal plate is divided or not (e.g., blue racer, common watersnake, northern ribbonsnake, eastern massasauga) are not mentioned. In at least one account (smooth greensnake), he refers (once) to the species by the wrong vernacular name (“common” greensnake). In the eastern American toad account, the word “species” is used mistakenly in place of “specimens.” Fortunately for the reader, such omissions/errors seem to be rare.

Each species account includes a small map of Michigan with a single dot placed centrally in each county in which the species occurs. Holman purposely chose to be rather vague about plotting occurrences because he had evidence that Michigan’s herpetofauna has “been targeted by illegal collectors.” He was concerned that dots indicating exact collection localities could be used by collectors “to find local herpetological ‘hot spots.’” The inclusion of a small eastern North America map showing the entire range of each species would have provided the reader with a sense of how Michigan relates to each species’ geographic range.

In regards to the distribution of boreal and western chorus frogs in Michigan, readers may wish to keep abreast of the work of Emily Moriarty Lemmon at Florida State University. Holman’s maps and discussion of the Michigan distribution of boreal chorus frogs indicates they are limited to Isle Royale; he plots western chorus frogs across the remainder of the state, including both the Upper and Lower peninsulas. The map in Lemmon et al. (2007), however, suggests that boreal chorus frogs range across the entire Upper Peninsula and that western chorus frogs occur only in the Lower Peninsula. Unfortunately,

Lemmon et al. (2007) did not have material from the Upper Peninsula when conducting their study, so Michigan herpetophiles will have to await an update of their work.

The species accounts are rich with information (including observations made outside of Michigan), and credited to various sources as well as Holman’s direct observations. Holman seems to rely heavily on Minton (2001) and Harding (1997) and quotes text from both tomes frequently. Rather than provide a glossary, Holman chose to “write with as little scientific jargon as possible.” When scientific jargon is unavoidable, Holman provides a definition of the word the first time it appears in the book. This could prove problematic for the reader who skips around the book to read about particular species of interest rather than reading the book cover to cover. For example, a novice herper who encounters an eastern tiger salamander and reads Holman’s account to learn more about the species will encounter the word “spermatophore.” Without a glossary of scientific terms to refer to, the reader may be left wondering about the identity of a spermatophore. Spermatophore is defined once, in the blue-spotted salamander account. There are similar examples for other terms (e.g., keeled scales and anal plate defined only in the first snake account—Kirtland’s snake). Thus, unless one reads the book from beginning to end, definitions of scientific terms may not be encountered. I did discover two entries in the General Index (“bogs” and “sibling species”) that were followed by a comma and the word, “defined.” It would have been helpful to the reader if other terms defined in the text were included in the General Index.

In many places Holman expresses genuine concern about the future of Michigan’s herpetofauna. For example, in the Preface, Holman states that Michigan’s herpetologists “fidget and fret about the diminishing populations of amphibians and reptiles in the state . . . not only . . . the officially threatened and endangered species of concern but also the many species that were very common throughout large portions of the state as recently as the early 1980s.” Some causes of these declines are mentioned in various species accounts and include habitat loss and fragmentation, global warming, human persecution, road mortality, introduction of predators, invasive plants, use of chemicals to control aquatic snails and lampreys, and run-off of herbicides, insecticides, and road salt into water bodies. Holman does not waver when he describes as “reprehensible” humans who “dogmatically kill any snakes they find” or shoot basking turtles for target practice (a practice known as “plinking”). I share Holman’s disgust with these people who, as he says, “waste wildlife resources.”

Holman freely shares other opinions throughout the species accounts; a few examples of which follow. Of red-eared sliders—which now range across much of the planet due to human introduction—Holman poetically states they have “survived the dingy pet shops and swirling toilet bowls to conquer the turtle world.” Holman “detests” the alternate moniker for eastern musk turtle (i.e., “stinkpot”). I’ve always liked “stinkpot” and cannot understand why Holman finds it so offensive. In at least two cases, Holman advises the reader on how to become a “herpetological hero” in Michigan: by finding 1) an extant population of western lesser sirens or 2) a new population of copper-bellied watersnakes. In expressing his dislike for collect-

ing and preserving amphibians for dissection in classrooms Holman writes, “a mudpuppy is a typical amphibian only by a long stretch of the imagination” and “to say that a frog is a typical vertebrate is ludicrous.” On a lighter note, he describes toad watching as “great fun.”

What I enjoy even more than his opinions are the brief anecdotal stories (“whimsical accounts”) Holman shares. In the eastern tiger salamander account, for example, Holman remembers finding a “huge, somewhat fidgety pile” of these salamanders (estimated to be at least 250 recently-metamorphosed individuals) in the dark corner of a basement while in search of an errant ping-pong ball. My favorite anecdote, however, is Holman’s story of being bitten by an eastern snapping turtle. It occurred “years ago” while Holman was fishing near Memphis, Tennessee, “sitting happily on top of a galvanized minnow bucket hoping to catch a catfish.” As he describes it, he felt “a sharp pain in my rear and discovered an eight-inch snapper hanging on my blue jeans.” The snapper released its grip when Holman stood up. The turtle walked to the water “amidst a hail of four-letters words” that Holman says he “acquired in the Navy.” This is one of those improbable stories that had it been relayed to me by a typical fisherman I would have considered a tall tale; but, because it came from someone with Holman’s credentials, I can accept it without hesitation and contemplate the turtle’s peculiar behavior.

Holman also shares interesting factoids and dispels myths. For example, we learn that eastern American toads living on Michigan’s islands are larger than their counterparts on the mainland and that this phenomenon is typical of island-inhabiting populations in many species. Holman assures the reader that neither toad urine nor handling of toads will “form warts on humans.” Holman also expresses his wonderment with nature: describing as “a truly amazing turnabout” the aquatic adult eastern newt returning to the terrestrial form when its pond dries. It is refreshing to see a well-respected professional herpe-

tologist unafraid to acknowledge his wonderment with his subject. I also discovered that Holman and I are kindred spirits, each of us moving amphibians and reptiles off the road and out of harm’s way whenever it is safe to do so.

The third principal section of the book is entitled, “Quaternary Remains of Michigan Amphibians and Reptiles.” This section is unique among state herpetofauna guides and provides detailed accounts of the amphibians and reptiles known to inhabit Michigan in the Pleistocene and Holocene, as well as those discovered at Michigan archaeological sites. Here the reader learns that cooked turtle bones have a “characteristic blue or white color” and that turtle shells—particularly those of Blanding’s turtles—were favored by Native Americans for use as bowls. Holman describes the fossil-hunting process and the uninitiated (like me) gains an appreciation for the saint-like patience required of paleoherpetologists. As a neoherpetologist, however, who enjoys interacting with living animals, I found this part of the book rather tedious until, that is, I came to Holman’s discussion of biogeography. Here the reader learns that Michigan’s herpetofaunal diversity is greatest in the southern half of the Lower Peninsula and lowest in the Upper Peninsula; a result of warmer temperatures (over time) and greater habitat diversity in the Lower Peninsula. Holman ends this section with a discussion of the herpetofauna of Lake Michigan islands.

After reading Holman’s opus, I regret never having made his acquaintance. I feel I could have learned a great deal from this man who knew so much about both contemporary herpetology and paleoherpetology. I thoroughly enjoyed his book and highly recommend it to anyone interested in Michigan or Midwestern herpetology. I consider it a welcome addition to my bookshelf and will have it in hand on my next trip to Michigan.

Acknowledgment

I thank Mike Dloogatch for entrusting me with the enjoyable task of reviewing Holman’s book and for his editorial suggestions.

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What You Missed at the July Meeting

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I suppose that getting a call at the last minute to fill in for a speaker who had to cancel might feel a little like being a back-up date, but our July speaker was anything but a second choice. Bryan Suson has been a presenter before at our meetings and will surely be a speaker again, but this time he was nice enough to fill in at the last minute. He's local, takes great photographs, is enthusiastic, and holds the interest of the audience with no trouble. To have a speaker such as he come in as a substitute is a coup for the CHS.

I've been lucky enough to have known Bryan for quite awhile but I googled him anyway and found perhaps the best description of him on the website of an environmental consulting company for which he occasionally works. Under the "Team" descriptions Bryan is listed as a biologist with "expertise" in "tropical ecology, birds, reptiles, amphibians, insects, field crew leader, and wildlife photography." Seems to sum it up, but that description is a little incomplete. It fails to describe how Bryan's dedication and enthusiasm colors every part of his endeavors, how his sense of responsibility means he is continually striving for perfection, how his sense of humor often makes the most onerous situation bearable, and how his looks attract the attention of women while his personality holds their interest. Bryan being Bryan, he'll probably blush when he reads this, but my observations give me no reason to modify that description. He does have a few faults. He's a little weak on New World tropical fishes and his sense of humor has on occasion been at my expense.

Bryan's talk was titled "Ecuador: Biodiversity in the New-World Tropics." He is a passionate advocate for Ecuador's wild places and his talk was meant to give to give us an overview of what that tiny equator-straddling country has to offer. I usually try to keep these articles in a journalistic mode rather than a personal mode because I normally find our speakers fascinating and myself boring. I haven't become any more interesting, but I'm going to combine some of my personal experiences within my account of Bryan's talk because I think Bryan short-changed himself during his talk. About two years ago Bryan announced he was starting up an ecotour company with the name of Biophoria. About two years ago I became financially independent (I retired). I knew that Bryan had several years experience guiding in the tropics, I knew Bryan, I had always wanted to go to the Amazon Basin, and I didn't think that I would have decades to fulfill that particular dream. I had experienced a talk he had given on Ecuador. I was convinced. I asked him to arrange a tour for four of us. On New Year's Eve of 2010, my wife, my daughter, my daughter's boyfriend, and I flew into Quito to begin two of the neatest weeks of my life. At the end of those two weeks I told Bryan to keep me in mind if he needed a body to round off another of his tours. A few months ago he called me with just such a situation, and on June 9, 2012, I once again found myself in Quito, Ecuador's capital, to begin two more extraordinary weeks in Ecuador. I am not going to describe either of those trips in detail, but I offer some of my experiences (in boldface type) as additions to Bryan's talk. I think Bryan

deliberately tries not to oversell himself or Biophoria. I have no such compunctions.

Bryan began with a map showing Ecuador in the northwest of South America and explaining that its biodiversity is generated by the habitat diversity of the three main regions: La Costa along the Pacific, La Sierra which is the Andes or highlands, and El Oriente, the eastern lowlands or the Amazon basin. Because of this diverse geography Ecuador boasts an extraordinary range of habitat and species. Except it doesn't—boast, that is. Ecuador is losing wild places at an extraordinary pace to population expansion, oil drilling, and logging and is certainly not one of the leaders in conservation in South America. Bryan broke the habitat into a few life zones consisting of the paramo, montane forest, foothills, lowland rainforest, tropical dry forest, and mangrove forest. The paramo is high elevation, 3000–5000 meters (10,000–16,000 feet). Bryan showed the CHS photos of a landscape with short vegetation, no tall trees, peat bogs, wet grasslands and strange looking plants formed in balls.

On our first trip he wanted to highlight as many of those zones as possible, so we started high up in the Andes in the paramo and worked our way down the east side of the mountains until we ended in the lowland tropical forests of Amazonia. After a night in a pleasant little hotel in Quito, we set off in our pleasantly large, private, 15-passenger bus headed up and east. Our altitude as we explored this terrain was about 14,000 feet. As we hiked into this extraordinary terrain we felt as if we had been dropped onto a different planet. Not a lot of herps at this altitude, but hummingbirds flitted low through the strange botany. Weird plants with bright flowers had us fascinated, and birds of prey circled against the backdrop of a volcano. The weather was exceptionally clear, but this landscape is normally cloaked in dense fog. When we attempted to return to our comfortable bus, even though we could see for miles, it was gone. It contained most of our gear, all of our money and passports, and the driver. It was our first stop on our first day in Ecuador and we were stranded without money, clothes, passports or transportation. Not a trial for us because Bryan handled it quickly and well. He hiked the mile or so to a highway, borrowed someone's phone, and cleared up the confusion with the driver while we explored more of the paramo. The bus returned and we headed for our next destination.

Bryan says that the montane rainforest may be the most beautiful of the Ecuadorian landscapes. Tree canopies are 25–30 meters (80–100 feet) overhead with branches laden with epiphytes and trunks covered with lichen and moss. Temperatures are cool and the air is damp. Clear bubbling streams are overhung with huge ferns that harbor glass frogs (family Centrolenidae) still to be described by science. Little is known of the natural history of the caecilians (order Gymnophiona) that slide through the detritus. Myriad moths display either aposematic or cryptic markings and sometimes both. The bright red eyes and moss-cryptic body of a female *Pristimantis eriphus* fill the screen.

We stop at a lodge where the gate is shut and the sign says CLOSED. It is New Year's Day and we assume that Bryan has mistaken the date but we're learning to respect Bryan's abilities as a guide. A quick word with the gatekeeper and we're escorted into a charming lodge. This is meant to be just a quick stop that Bryan has arranged. We hike a little to a bridge over a fast moving stream where we watch torrent ducks flit in and out of rapids as easily as we step in and out of our houses. Returning to the lodge, in spite of the fact that they're closed, we're graciously offered food and drink while we sit in this lodge and watch hummingbirds coming to its multitude of feeders. The variety is astonishing, the setting idyllic. This trip is going to be good. We head to the next lodge, our stop for the night.

San Isidro Lodge is well known among birders and there was a group there when we arrived. Our party is a mixed group—only I and my daughter are interested in herps and only I am interested in birds—but Bryan drops little tidbits of information about many of the species we see and manages to keep all of us interested on our day and night hikes. We're still in the highlands so snakes are rare, but tiny frogs are common, exquisite birds can be seen from the lodge balcony, and Bryan has brought a black light. Perched on the side of a valley, the balcony is a perfect place to set up a black-light lure. We're all kept up late into the night staring at the multitude of moths drawn to our site. None of us are entomologists or lepidopterists, but that night we relish the variety of insects. After a couple of days finding *Pristimantis* frogs, birds and bugs and relishing gourmet meals and beautiful scenery, we head to our next lodge.

Bryan's talk moves to the Chocó foothills and lowlands of western Ecuador opening with a dramatic habitat shot starring a little dart frog (*Oophaga sylvatica*). A pink and white crab spider sits perfectly camouflaged on a pink and white orchid, a glass frog (*Hyalinobatrachium valerioi*) stands guard over its eggs, and a gorgeous bright yellow treefrog (*Hypsiboas picturatus*) peers from the screen. A bright green *Anolis fraseri* clasps a branch and a coral-snake-mimicking galliwasp lizard (*Diploglossus monotropis*) is stunning in bright reddish-orange, black, and white. Snakes appear at these altitudes. A black and yellow bird-eating snake (*Pseustes shropshirei*) displays the attitude that frequently defines these snakes and a big-eyed snail-eater



Even without its bright yellow coloring this *Hypsiboas picturatus* is engaging. Photograph by Bryan Suson.

(*Dipsas andiana*) twists around a twig. A green and pink eyelash viper (*Bothriechis schlegelii*) is poised waiting for its next meal. A nice picture of an oncilla, or little spotted cat, surprises us, but not as much as it surprised Bryan. He related with hilarity how he came upon this little spotted cat and how he lured it into camera range by imitating the distress call of a rodent.

My second expedition with Biophoria began about March 2012 with a call from Bryan wondering if I wanted to accompany another tour. The originators of the tour were Andrew and Sarah Gilpin, two of my favorite individuals. They're fun, witty, and fantastic photographers. A friend of theirs, Derek Dunlop, would be going along, but they needed four to make the trip. In their desperation they allowed me to join. This trip would be to the Chocó in northwestern Ecuador and the Amazonian lowlands. The Bilsa research station in the Chocó would yield amazing animals. Bryan had been to Bilsa, but only during the dry season when one could reach the research station by truck. During the 10-month-long wet season, one either walks or rides mules the 10 miles to the station. We walked and rode for six or seven hours through mud that was six to 30 inches deep. Shortly after we began hiking in we spotted a black and white worm lizard (*Amphisbaena varia*) crawling through a ditch. To find this radically fossorial animal this early and this easily seemed to presage a great trip. The research station was basic with no electricity, but they cooked meals for us and we slept on beds under mosquito netting. For four days and six nights we hiked the muddy, steep trails through the rich tropical forest of the Bilsa biological preserve, finding eyelash vipers, northern eyelash boas (*Trachyboa boulengeri*), little prehensile-tailed salamanders (*Bolitoglossa biseriata*), and right outside our rooms, howler monkeys. Calls of *Hypsiboas* boans filled the nights, along with the bats flying through our rooms. We found a caecilian (*Caecilia nigricans*?) over six feet long! Yes, we have pictures. This group was hardcore herpers and photographers carrying 20–30 lbs of camera gear and working until the early morning hours. If you're on Facebook it's worth tracking down their pages to view some spectacular photographs. Another six-and-a-half hours of mud and five hours in wheeled transportation and we were back in Quito to prepare for the second week.



A very rare find and photograph. An oncilla, or little spotted cat (*Leopardus tigrinus*). Photograph by Bryan Suson.



The amazing face of a northern eyelash boa (*Trachyboa boulengeri*). Photograph by Bryan Suson.



This well-camouflaged Surinam toad (*Pipa pipa*) was nearly impossible to see. Photograph by Bryan Suson.



Nope, it's not an ant. It's an ant-mimicking spider. Photograph by Bryan Suson.



What are you looking at? Mata mata (*Chelus fimbriata*). Photograph by Bryan Suson.



Rhinella margaritifera, a common South American toad. Photograph by Bryan Suson.



Big-headed snail-eating snake (*Dipsas andiana*). Photograph by Bryan Suson.



Grace Archer about to return a little squirrel monkey rescued after falling into the river. It didn't show appreciation for the save. Photograph by Matt Placek.

Bryan's presentation talked of the increased diversity to be found in the east Andean foothills where low altitude and high altitude creatures often converge. This high-rainfall landscape is transected by clear, cold streams and thick forests covering often steep terrain. It is much like the Chocó, but the animals frequently differ because of the Andes barrier. Pictures of bizarre katydids and fantastic moths paraded in front of us.

My exposure to the east Andean foothills was on our first trip to Ecuador. We spent a few nights at the Wild Sumaco Lodge in the eastern foothills of the Andes. This lodge also catered to birders and we continually saw why. Spectacular birds were the norm, including the many species of hummingbirds attracted to the lodge's feeders. The land was steep, though not as muddy as the Chocó. Finding a three-foot-long earthworm caused excitement and we were finally low enough to find our first snake (*Oxyrhopus petolarius*). My daughter found a snail as big as a Pepsi can and my wife spotted a sleeping *Potamites* sp lizard. We had lots of exposure to perhaps the most ominous looking katydid on the planet, *Panacanthus cuspidatus*, with a bite that matches its fearsome look. The black light was again set up with equally spectacular results.

Bryan stated that everyone who goes to South America wants to and should see the Amazon. With a shot of dozens of parrots and parakeets surrounding what looked like a small damp cave, Bryan spoke about clay licks that attract everything from birds to tapirs to monkeys for the mineral content. We scanned slides trying to spot potoos, cryptic nocturnal birds that perch on and blend with stumps during the day. A mosaic of cryptic katydids emphasized the diversity found in the lowlands. Pictures of brilliant and toxic caterpillars and brilliant and toxic frogs paraded across the screen. A smooth-fronted caiman (*Paleosuchus trigonatus*) showed all of its teeth and a close-up

shot of a gorgeous red and black snake (*Oxyrhopus formosus*) held our attention. Black, white and red coral snakes (*Micrurus* spp.), blue and green pitvipers (*Bothriopsis* spp.) with caudal lures, a toadhead pitviper (*Bothrocophias hyoprora*), lanceheads (*Bothrops atrox*), which are called *equis* in Ecuador, and the holy grail of herpers in Ecuador, a bushmaster (*Lachesis acrochorda*) presented us with some of the finds of Bryan's seven years of traipsing the Ecuadorian landscape.

Shiripuno was the last lodge on both of my trips to Ecuador. Deeper into the Amazon than more genteel lodges, Bryan chose it because the landscape is less disturbed and the animals less hunted. On my first trip Bryan gave me the choice of nicer accommodations or greater chance of seeing neat stuff. I chose the latter and Shiripuno was the answer. I was excited about repeating a visit on my second trip. A 35-minute flight, two hours of wheeled transportation, and about four-and-half hours in a boat brought us to the lodge. While the lodge lacks electricity, the showers are cold, and the rooms are open, our meals were prepared on our schedule and our beds were made each day. The canoe was available to take us along or across the river. My daughter was able to return a rescued baby squirrel monkey to its troop. Eye shine highlighted Amazon tree boas (*Corallus hortulanus*) clinging to vines at night. On the second trip we were amazed at finding a mata mata (*Chelus fimbriata*), Surinam toads (*Pipa pipa*), lanceheads, a tarantula eating a frog, *Hypsiboas* *boans* and monkey frogs (*Phyllomedusa tomopterna*), and plenty of weird insects all in or near a small pond and all within a very short time. On the first trip we spotted seven different species of monkeys and on the second trip fifteen species of mammal, including a brocket deer, ocelot, and river otter. We went fishing for piranha and swam in the river to cool off. Bryan allowed us to set the pace and schedule but always had a plan that would satisfy our desires.

Bryan summed up his talk with shots of the threats to the Ecuadorian landscape and we saw some of the devastation on our travels. It's a country that is undergoing rapid and extensive change, but there is still magical places left to explore, at least for a while. Bryan's first presentation to the CHS sold me on going to Ecuador. His second presentation confirmed what I had seen. He's got enthusiasm, knowledge, humor, and a desire to give you the tour that you want, from a killer herping adventure that may be a little challenging but will yield incredible animals to a luxury tour with your own private vehicle to transport you around the country. He never seems to tire in the field and can keep you interested even in the big city of Quito, where it often seems he knows everybody. At the end of his talk, I was asked if I would be part of another of Bryan's tours. You bet. Though Bilsa would have to be in the dry season. I'm too old to do that 10-mile muddy hike again.

Herpetology 2012

In this column the editorial staff presents short abstracts of herpetological articles we have found of interest. This is not an attempt to summarize all of the research papers being published; it is an attempt to increase the reader's awareness of what herpetologists have been doing and publishing. The editor assumes full responsibility for any errors or misleading statements.

PROTECTING *PITUOPHIS* IN BRITISH COLUMBIA

K. E. Williams et al. [2012, Canadian J. Zoology 90(3):304-312] note that a common strategy for reptile conservation is to establish reserves around nesting or hibernation sites. The government of British Columbia, Canada, mandates protection of 200–300 ha wildlife habitat areas (WHAs) around hibernation sites of the federally threatened Great Basin gophersnakes (*Pituophis catenifer deserticola*), but practical constraints result in a mean size of 193 ha. To evaluate the efficacy of this reserve size, the authors radio-tracked 39 adult gophersnakes at four study sites in the Okanagan Valley in 2006 and 2007. Home ranges averaged 10.5 ± 1.7 ha. The maximum distance traveled from a hibernation site was 2400 m, whereas the maximum distance dispersed averaged 520 ± 65 m. An idealized circular WHA of 193 ha with the hibernation site at the centre would be large enough to contain gophersnake home ranges, but the dispersal data show that only 85% of snakes would stay within that area. Small or asymmetrical WHAs likely protect even fewer gophersnake locations. The authors recommend that WHAs be expanded if possible because the high mobility of gophersnakes suggests that current reserves may not offer adequate protection.

LONG-TERM GROWTH OF DESERT TORTOISES

P. A. Medica et al. [2012, J. Herpetology 46(2):213-220] measured the growth of a cohort of 17 semi-wild desert tortoises (*Gopherus agassizii*) located in Rock Valley, Nevada, over a 47-yr period beginning in 1963. The tortoises were initially marked as hatchling and juvenile animals between the years 1963 and 1965 and ranged in size from 47 to 77 mm in plastron length. Ages of 1–4 yr were assigned to the tortoises at initial capture based on their body size. These tortoises were recaptured, measured, and weighed approximately annually since their initial capture. Growth of male and female tortoises did not differ significantly until animals reached the age of 23–25 yr. Annual tortoise growth was correlated with the production of ephemeral vegetation, while accounting for size, sex, and repeated measurements of the animals as well as the interval between measurements. However, the production of ephemeral plants was likewise highly correlated (non-linearly) with winter rainfall. Stochastic predation events between 2003 and 2007 decimated this cohort of tortoises. The average age of the long-term surviving tortoises from this cohort was 43 yr with a range of 39–47 yr. Twelve of the tortoises survived to the age of 39 yr and 11 of the 12 reached 40 yr.

NEST GUARDING BY GOPHER TORTOISES

A. M. Grosse et al. [2012, Chelonian Conservation and Biology 11(1):148-151] note that nest guarding is rarely observed among reptiles. Specifically, turtles and tortoises are generally perceived as providing no nest protection once the eggs are laid. In this note, illustrated by photographs, the authors describe observations of nest guarding by female gopher tortoises (*Gopherus polyphemus*).

BAIRD'S RATSNAKE–TEXAS RATSNAKE HYBRIDS

M. W. Vandewege et al. [2012, J. Herpetology 46(1):56-63] note that two species of ratsnake (*Elaphe bairdi* and *Elaphe obsoleta*) inhabit different environments in Texas but come into contact with one another on the southwestern edge of the Edwards Plateau. Morphological intergrades have been described by previous studies, yet no genetic evidence of hybridization has ever been reported. The authors tested for evidence of hybridization and population structure using geographic data, mitochondrial DNA, and microsatellite markers. Cytochrome-b fragments were analyzed for 23 *E. bairdi* and 33 *E. obsoleta lindheimeri* from Texas using maximum parsimony and Bayesian-based approaches. All individuals were subjected to Bayesian assignment probability tests based on six microsatellite loci. Overall, sequence divergence was low within *E. o. lindheimeri* (0.1–0.5%), and higher within *E. bairdi* (0.1–2.16%). Significant structuring was recovered from mitochondrial haplotypes but not from microsatellite genotypes. Phenotypic intergrades exhibited intermediate or incongruent species assignments based on their nuclear and mitochondrial genomes, suggesting admixture. However, gene flow between *E. bairdi* and *E. o. lindheimeri* remains strictly constrained to the zone of sympatry, and these separate lineages remain intact and independently evolving.

JUVENILE HAWKSBILL SEA TURTLES

M. D. Berube et al. [2012, Chelonian Conservation and Biology 11(1):33-43] note that despite the recognition of the historical importance of hawksbills in the Caribbean region of Honduras, prior sea turtle research in the area has been extremely limited, and little is known about hawksbill turtle (*Eretmochelys imbricata*) ecology from this region. The authors tracked 6 juvenile hawksbills (28.7–35.6 cm, straight carapace length [SCL]) with radiotelemetry off the coast of Roatán in the Bay Islands of Honduras, conducted habitat assessments at 14 sites, and examined the diet of 5 juvenile hawksbills (19.8–49.7 cm, SCL) using gastric ($n = 4$) and fecal ($n = 1$) samples. Home ranges of all 6 turtles were small, with 100% minimum convex polygons from 0.15 to 0.55 km². The habitat assessment showed that common prey items in hawksbill diets were abundant in areas where juvenile hawksbills were resident and in nonresident areas, with sponges (*Chondrilla* sp., *Geodia* sp.) and octocorals (*Pseudopterogorgia* sp.) being most prevalent. Sponges were found to be the primary component in the diet, comprising 59% of total ingesta. The most prevalent sponge species in the diet samples were *Melophlus ruber* and *Chondrilla caribensis*. Although *C. caribensis* is a common constituent of hawksbill diets, the current study provides the first report of *M. ruber* as a component of hawksbill diets. Home ranges of juvenile hawksbills in the Port Royal region of Roatán are small (< 1 km²) and their primary dietary component is the sponge *M. ruber*. Conservation efforts on Roatán should be established in the Port Royal region, and should include protection of dietary items and turtles.

Unofficial Minutes of the CHS Board Meeting, July 13, 2012

The meeting was called to order at 7:53 P.M. at the Schaumburg Public Library. Board members Lawrence Huddleston, Barbara Khan and Deb Krohn were absent.

Officers' Reports

Recording Secretary: The minutes of the June 15, 2012, board meeting were read and accepted.

Treasurer: The June financial report was presented and accepted. The ReptileFest financial report was discussed.

Membership Secretary: The current count stands at 510.

Sergeant-at-arms: Jim Foster reported that attendance at the May general meeting was 48

Committee Reports

Shows:

- Notebaert, first full weekend of each month. Josh Chernoff is coordinator.
- Rockin' for the Reptiles, Midwest Museum of Natural History, Sycamore, June 30. Dick is looking for volunteers.
- Museum of Science and Industry Member's Night, July 25. Jenny Vollman will coordinate this event.
- SEWERfest, August 5, 10–3. They donate a table to the CHS.

ReptileFest 2013: The dates have been confirmed—April 13-14, 2013. This will be the 20th anniversary!

Old Business

Junior Herpers Club: Details are still being worked out.

Conservation: The following organizations / programs will receive donations from the CHS:

Massasauga conservation at Carlyle
San Salvador Iguana Research Center
Mabuwaya Foundation
Amphibian Ark
Widecast

Declining Amphibian Populations Task Force

Cindy Rampacek moved to allocate \$1000 for donation to each of these six organizations. Jenny Vollman seconded. Discussion followed. The vote was unanimous in favor of the donations. Jason will write a letter to include with the checks.

Petition against Snapperfest: This is still being looked into.

New Business

Nominating Committee: Cindy Rampacek and Linda Malawy will serve on the committee and will organize it.

Raffle items need storage: Josh Chernoff is in the process of selling his house, and will need to relocate the raffle items he has been storing.

NARBC, October 13-14: We need people to staff the CHS table who can commit to certain hours to avoid the table being un-manned.

Round Table

Mike Dloogatch picked up some metal framed aquariums that were donated to the CHS and is trying to decide what to do with them. He would like to put some of them in the raffle.

Nancy Kloskowski, Bob Bavirsha and others had a small exhibit at a Petsmart for Animal Care and Control.

Cindy Rampacek reported that Snake Day in Sanderson, Texas, was fun!

The meeting was adjourned at 9:25 P.M.

Respectfully submitted by Jenny Vollman



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For sale: **highest quality frozen rodents**. I have been raising rodents for over 30 years and can supply you with the highest quality mice available in the U.S. These are always exceptionally clean and healthy with no urine odor or mixed in bedding. I feed these to my own reptile collection exclusively and so make sure they are the best available. All rodents are produced from my personal breeding colony and are fed exceptional high protein, low fat rodent diets; no dog food is ever used. Additionally, all mice are flash frozen and are separate in the bag, not frozen together. I also have ultra low shipping prices to most areas of the U.S. and can beat others shipping prices considerably. I specialize in the smaller mice sizes and currently have the following four sizes available: Small pink mice (1 day old—1 gm), \$25 /100; Large pink mice (4 to 5 days old—2 to 3 gm), \$27.50 /100; Small fuzzy mice (7 to 8 days old—5 to 6 gm), \$30/100; Large fuzzy mice /hoppers (10 to 12 days old—8 to 10 gm), \$35/100 Contact Kelly Haller at 785-234-3358 or by e-mail at kelhal56@hotmail.com

For sale: High quality, all locally captive-hatched tortoises, all bred and hatched here in the upper midwest. Baby leopards, Sri Lankan stars, and pancakes usually available, and are all well-started and feeding great! Leopards are \$125 ea., Sri Lankans (2012 hatched) \$475 ea. And Pancakes are \$195 ea. Leopards for out of state sale/shipping require a veterinary health certificate (inquire for cost). E-mail at KKranz1@wi.rr.com or call Jim or Kirsten at 262 654 6303.

Herp tours: **Costa Rica herping adventures**. Join a small group of fellow herpers for 7 herp-filled days. We find all types of herps, mammals, birds, and insects, but our target is snakes. We average 52 per trip, and this is our 10th year doing it. If you would like to enjoy finding herps in the wild and sleep in a bed at night with air-conditioning, hot water and only unpack your suitcase once, instead of daily, then this is the place to do it. Go to our web-site <http://hiss-n-things.com> and read the highlights of our trips. Read the statistics of each trip and visit the link showing photos of the 40 different species we have found along the way. E-mail at jim.kavney@gmail.com or call Jim Kavney, 305-664-2881.

Line ads in this publication are run free for CHS members—\$2 per line for nonmembers. Any ad may be refused at the discretion of the Editor. Submit ads to mdloogatch@chicagoherp.org.



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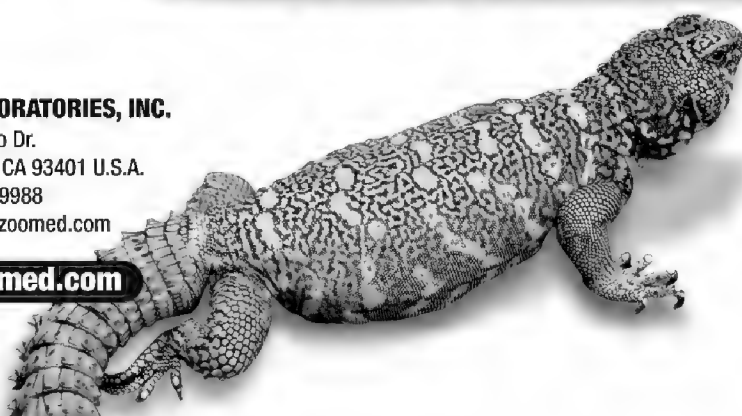
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UPCOMING MEETINGS

The next meeting of the Chicago Herpetological Society will be held at 7:30 P.M., Wednesday, August 29, at the Peggy Notebaert Nature Museum, Cannon Drive and Fullerton Parkway, in Chicago. **Roger Repp** of Tucson, Arizona, will present “Burrow Buddies — or Not? (What’s up with That?).” This program deals with desert herp species that den communally. Roger spent his formative years in the Chicago suburbs. He came out of his mother’s womb a herpetologist, but the formation of the Chicago Herpetological Society was the catalyst for a lifelong passion for our crawly friends. By profession, he is Instrument Shop Supervisor for the National Optical Astronomy Observatory. By avocation, he is a rabid field herpetologist who has averaged 800 field hours per year in Arizona since 1989.

At the September 26 meeting **Jeff Lemm**, of the San Diego Zoo’s Institute for Conservation Research, will speak on “Rock Iguanas: Conservation of the World’s Most Endangered Lizards.” In addition to rock iguanas, Jeff’s professional research interests include monitor lizards and native Southern California herpetofauna. Jeff also enjoys photographing wildlife and has traveled extensively throughout the world in search of his subjects.

The regular monthly meetings of the Chicago Herpetological Society take place at Chicago’s newest museum—the **Peggy Notebaert Nature Museum**. This beautiful building is at Fullerton Parkway and Cannon Drive, directly across Fullerton from the Lincoln Park Zoo. Meetings are held the last Wednesday of each month, from 7:30 P.M. through 9:30 P.M. Parking is free on Cannon Drive. A plethora of CTA buses stop nearby.

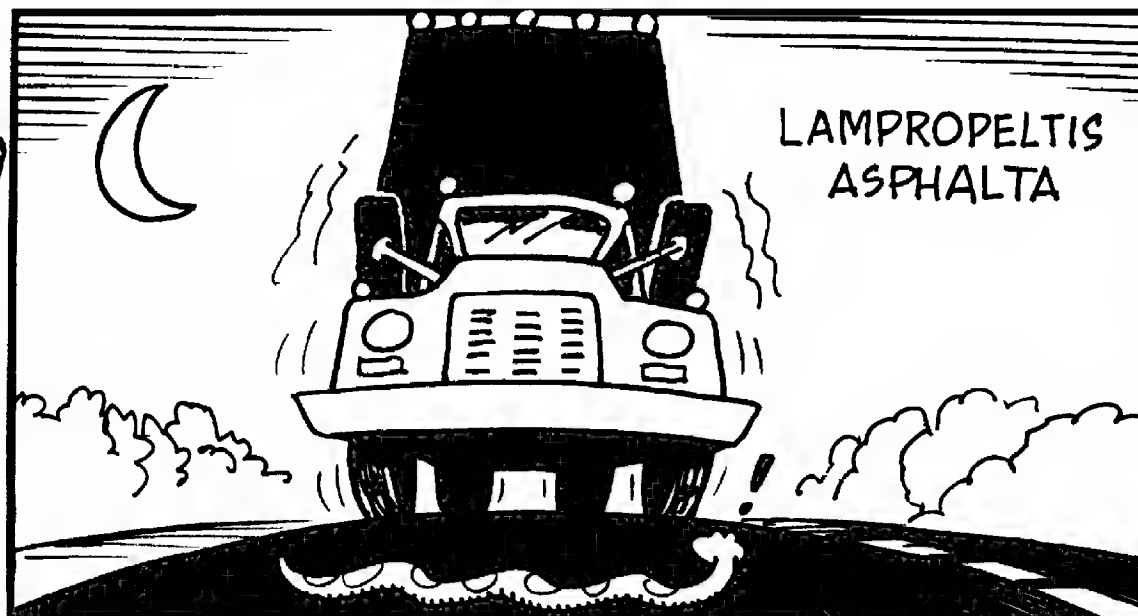
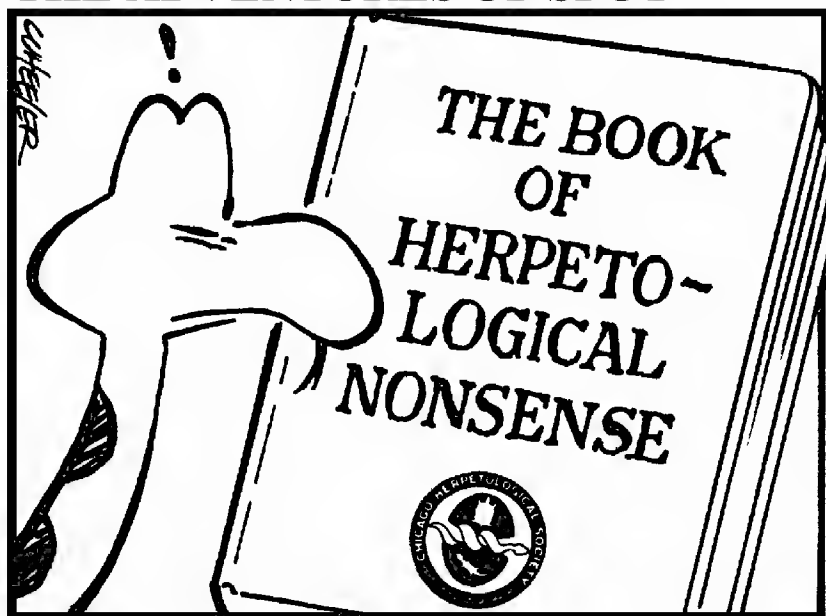
Board of Directors Meeting

Are you interested in how the decisions are made that determine how the Chicago Herpetological Society runs? And would you like to have input into those decisions? If so, mark your calendar for the next board meeting, to be held at 7:30 P.M., September 14, in the adult meeting room on the second floor of the Schaumburg Township District Library, 130 S. Roselle Road, Schaumburg.

The Chicago Turtle Club

The monthly meetings of the Chicago Turtle Club are informal; questions, children and animals are welcome. Meetings normally take place at the North Park Village Nature Center, 5801 N. Pulaski, in Chicago. Parking is free. For more info visit the group’s Facebook page.

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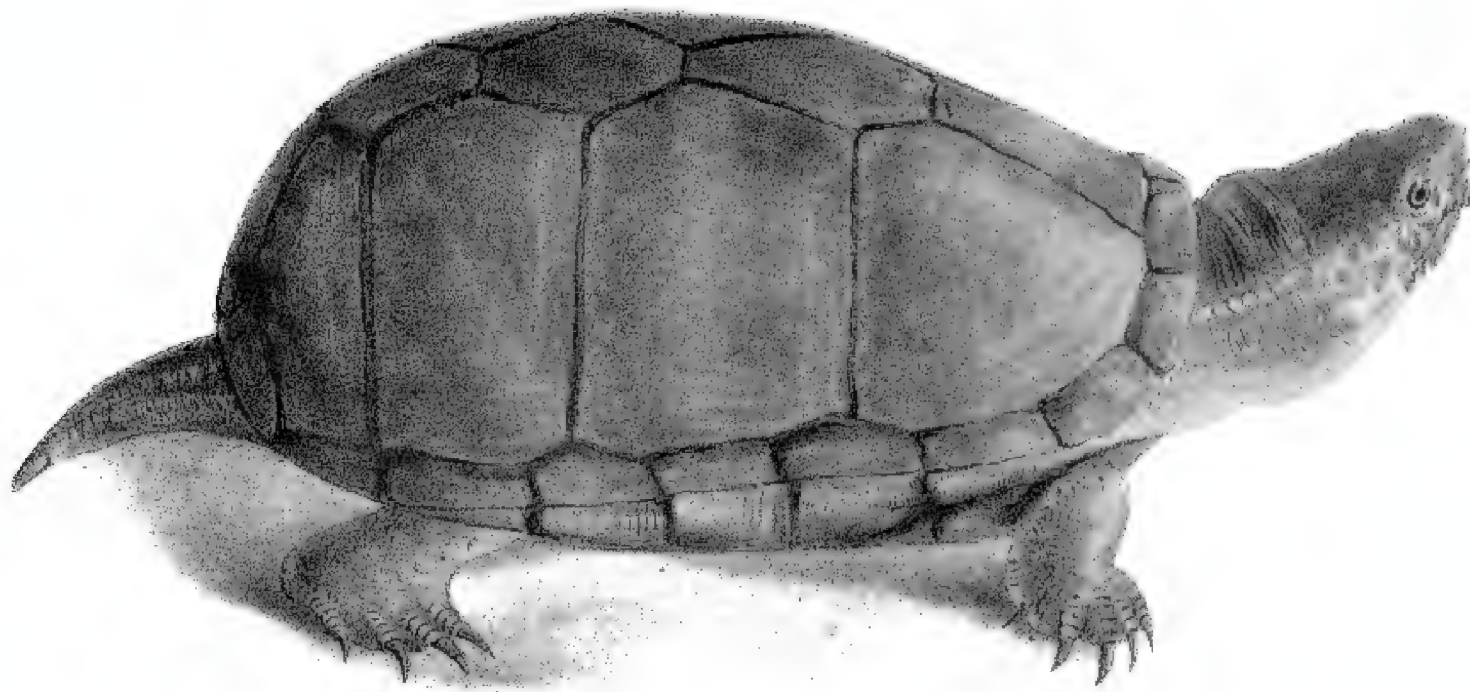
BULLETIN

of the

Chicago Herpetological Society



Volume 47, Number 9
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Notes on Reproduction of Long-tailed Brush Lizards, <i>Urosaurus graciosus</i> (Squamata: Phrynosomatidae), from California	Stephen R. Goldberg	109
Book Review: <i>The Lizard King, The True Crimes and Passions of the World's Greatest Reptile Smugglers</i> by Bryan Christy	Drew Newman	112
What You Missed at the August Meeting	John Archer	113
Herpetology 2012		116
Unofficial Minutes of the CHS Board Meeting, August 17, 2012		119
Advertisements		120

Cover: Eastern mud turtle, *Kinosternon subrubrum*. Drawing (as *K. pensylvanicum*) from *Zoology of New-York or the New-York Fauna. Part III. Reptiles and Amphibia* by James E. De Kay, 1842.

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Notes on Reproduction of Long-tailed Brush Lizards, *Urosaurus graciosus*
(Squamata: Phrynosomatidae), from California

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Abstract

The reproductive cycle of *Urosaurus graciosus* from California was examined utilizing a histological analysis of museum specimens. Males were reproductively active from March to August. A new minimum size for sexual maturity (SVL = 39 mm) is reported for male *U. graciosus*. Females were reproductively active in spring and summer. Mean clutch size ($n = 19$) was 5.1 ± 1.1 SD, range = 3–7. The smallest reproductively active female (follicles > 4 mm) measured 48 mm SVL. There was a significant positive correlation between female body size and clutch size. Two females from May with oviductal eggs were also undergoing concurrent yolk deposition for a subsequent clutch indicating *U. graciosus* can produce multiple clutches in the same reproductive season. *Urosaurus graciosus* exhibits a reproductive cycle longer in duration (March into August) than occurs in several other southwestern lizard species.

Urosaurus graciosus Hallowell, 1854, ranges from southern Nevada to northwest Sonora and northeast Baja California, Mexico, to central Arizona (Stebbins, 2003). The biology of *U. graciosus* is summarized in Vitt and Dickson (1988). Previous detailed studies on *U. graciosus* from Arizona are by Gates (1963), Vitt and Ohmart (1975) and Vitt et al. (1978). Anecdotal accounts of *U. graciosus* information including months of reproduction and clutch sizes are in: Shaw (1952), Stebbins (1954, 2003), Vitt (1977), Behler and King (1979), Brennan and Holycross (2005, 2006), Lemm (2006), Rau (2009), Stebbins and McGinnis (2012). This paper presents results of a histological examination of *U. graciosus* museum specimens from California. To my knowledge, there is no detailed information on *U. graciosus* reproduction from California. Because of the difficulty of obtaining permits for monthly collections of lizard samples, utilization of museum collections for obtaining reproductive data has become increasingly important. Information on the reproductive biology of lizards such as time of egg and sperm production, clutch size, number of clutches produced are useful in formulating conservation policies (Gibbons, 1994).

Methods

A sample of 122 *U. graciosus* consisting of 64 males (mean snout–vent length [SVL] = $51.0 \text{ mm} \pm 4.9$ SD, range = 39–62 mm), 44 females (mean SVL = $50.8 \text{ mm} \pm 3.0$ SD, range = 46–58 mm), 12 subadults (mean SVL = $41.5 \text{ mm} \pm 2.5$ SD, range = 38–43 mm) and 2 neonates (mean SVL = $25.5 \text{ mm} \pm 0.71$ SD, range = 25–26 mm) was examined from the herpetology collection of the Natural History Museum of Los Angeles County (LACM) Los Angeles, California. *Urosaurus graciosus* were collected 1935–1973.

The SVL of each specimen was measured from the tip of the snout to the posterior margin of the vent to the nearest mm. A small incision was made in the lower part of the abdomen and the left gonad was removed for histological examination. Gonads were embedded in paraffin and sections were cut at 5 μm

and stained with Harris hematoxylin followed by eosin counterstain (Presnell and Schreiber, 1997). Histology slides were deposited in LACM. Enlarged follicles (> 4 mm) or oviductal eggs were counted, no histology was performed on them. An unpaired *t*-test was used to test for differences between male and female SVLs; the relationship between female body size (SVL) and clutch size was examined by linear regression analysis using Instat 3 (Graphpad, San Diego, CA).

Results

There was no significant size difference between adult mean male and female body sizes (SVL) unpaired *t*-test, $df = 106$, $t = 0.13$, $P = 0.89$. Monthly stages in the testicular cycle are in Table 1. Two stages of the testicular cycle were present: (1) recrudescence, a proliferation of germ cells for the next period of spermiogenesis (sperm formation) is under way. Primary spermatocytes are the predominant cells; (2) spermiogenesis, lumina of the seminiferous tubules are lined by sperm or clusters of metamorphosing spermatids. Males were reproductively active from March to August. In one male from October (LACM

Table 1. Monthly stages in the testicular cycle of 64 *Urosaurus graciosus* males from southern California. * = residual sperm in lumen, germinal epithelium exhausted.

Month	N	Recrudescence	Spermiogenesis
March	2	1	1
April	27	3	24
May	21	1	20
June	3	0	3
July	5	0	5
August	4	0	4
October	2	1	1*

Table 2. Monthly stages in the ovarian cycle of 44 *Urosaurus graciosus* females from southern California. ** = 2 females with oviductal eggs and concurrent yolk deposition. * = 1 female with oviductal eggs and concurrent yolk deposition.

Month	N	Quiescent	Early yolk deposition	Follicles > 4 mm	Oviductal eggs
April	10	3	2	5	0
May	25	12	2	9	2**
June	1	1	0	0	0
July	2	2	0	0	0
August	4	1	0	1	2*
September	1	1	0	0	0
October	1	1	0	0	0

18904), the germinal epithelium of the seminiferous tubules was exhausted but residual sperm, produced in summer, remained in the lumina. The smallest reproductively active male (spermiogenesis in progress) measured 39 mm SVL and was collected in April (LACM 115646).

Monthly stages in the ovarian cycle are in Table 2. Four stages were present: (1) quiescent, no yolk deposition in progress; (2) early yolk deposition; (3) enlarged ovarian follicles (> 4 mm); (4) oviductal eggs. Females were reproductively active in spring and summer (Table 2). Two May females with oviductal eggs (LACM 18894, 97810) were also undergoing concurrent yolk deposition for a subsequent clutch, as was one August female (LACM 37813). Mean clutch size ($n = 19$) was 5.1 ± 1.1 SD, range = 3–7. The smallest reproductively active female (4 follicles > 4 mm) measured 48 mm SVL (LACM 97791) and was collected in May. A series of 12 female *U. graciosus* smaller than 48 mm SVL (mean = $41.6 \text{ SVL} \pm 2.5 \text{ SD}$, range 38–44 mm) was found to contain quiescent ovaries. Thus 48 mm SVL likely approximates the minimum size for *U. graciosus* female reproduction in California. Linear regression analysis indicated there was a significant positive correlation between female body size and clutch size ($n = 19$, $r = 0.51$, $P = 0.02$). This relation is shown by the equation: $Y = -7.74 + 0.25X$. Two neonates measuring 25 mm SVL (LACM 18891) and 26 mm SVL (LACM 22336) were collected 20 November and 13 September, respectively.

Discussion

Vitt et al. (1978) reported the smallest male with sperm in the testis from Arizona measured 42 mm SVL. My finding of a male undergoing spermiogenesis at 39 mm SVL is a new minimum size for reproductive maturity for *U. graciosus* males.

A correlation between spring rainfall, associated resource levels and reproductive success in *U. graciosus* was reported by Vitt et al. (1978). As my samples come from a range of years (1935–1973), I could not examine this relationship, although differences in the onset of female reproductive activity in *Sceloporus occidentalis* from southern California were noted in years of varying rainfall (Goldberg, 1975a). Vitt et al. (1978) reported the smallest reproductive *U. graciosus* female from Arizona

measured 44 mm SVL and the largest measured 66 mm SVL. This range of mature females is slightly larger than I recorded (48–58 mm SVL) for this species from California. Gates (1963) reported a mean clutch size of 4.6 ± 0.4 , range = 2–7 for 12 *U. graciosus* and Vitt and Ohmart (1975) reported a mean clutch size of 5.3, range 3–10 ($n = 23$) from Arizona. The presence of 2 May females with oviductal eggs and concurrent yolk deposition indicates *U. graciosus* can produce multiple clutches in the same reproductive season. This was previously reported by Vitt and Ohmart (1975), Vitt (1977) and Vitt et al. (1978). Regarding the August *U. graciosus* female with oviductal eggs and concurrent yolk deposition, because of the late time in the reproductive season, it is not known if an egg clutch would have been produced or if the vitellogenic follicles would have undergone atresia (= spontaneous degeneration). Incidences of follicular atresia increase late in the reproductive season when vitellogenic follicles that do not ovulate are reabsorbed (Goldberg, 1973, 1975b).

Other reports of *U. graciosus* reproduction from California are similar to my findings: a clutch of 4 eggs deposited on 19 May in San Diego County (Shaw, 1952); 1–2 egg clutches of 4–5 eggs deposited May to August (Stebbins and McGinnis, 2012); 1–2 clutches of as many as 10 eggs (Lemm, 2006).

The two neonates reported were within the size range of *U. graciosus* neonates from Arizona (19–27 mm) reported by Gates (1963).

Urosaurus graciosus exhibits a reproductive cycle longer in duration (March into August) than occurs in several other southwestern lizard species, for example, *Dipsosaurus dorsalis* (Mayhew, 1971), *Sceloporus occidentalis* (Goldberg, 1974), *Sceloporus vandenburgianus* (as *Sceloporus graciosus*) (Goldberg, 1975b), *Phrynosoma blainvillii* (as *Phrynosoma coronatum*) (Goldberg, 1983) in which reproduction commences in spring and concludes in July.

Acknowledgment

I thank G. Pauley (LACM) for permission to examine *U. ornatus*.

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Appendix

Specimens of *Urosaurus graciosus* from California (by county) examined from the herpetology collection of the Natural History Museum of Los Angeles County (LACM).

California: **Imperial:** LACM 8896, 18894, 18897-18904, 18906-18910, 37811-37814, 52837, 61949, 97740 97747, 97749, 123400.

Riverside: LACM 18891-18893, 22329-22333, 22335, 22336, 22338, 27364-27367, 52838, 52839, 52841, 62489, 97752-97761, 97763, 97764, 97767-97770, 97773-97777, 97778, 97780-97798, 97800-97809, 115646, **San Bernardino:** LACM 18888, 18889, 21904, 70248, 70249, 70251-70253, 97810, 97812-97817, 97819, 139661-139663. **San Diego:** LACM 27368.

This book was reviewed favorably, although with some reservations, in these pages by Dave and Tracy Barker shortly after it appeared [Bull. Chicago Herp. Soc. 43(11):177-178]. Here's another review, also favorable, but from a different perspective.

**Book Review: *The Lizard King, The True Crimes and Passions of the World's Greatest Reptile Smugglers* by Bryan Christy. 2008. Twelve, New York and Boston.
ISBN-13: 978-0-446-58095-3. Hardcover / Paperback / E-book.**

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A wonderful thing about nonfiction as a genre is that sometimes arcane subject matter can draw in uniquely qualified writers. Bryan Christy exemplifies this. Once a Washington, D.C., attorney, he traded in his scripted and robotic life to work as a freelance journalist for *National Geographic*.

The Lizard King is his first book and it's a majestic effort. It is so stunningly well written and pays such meticulous attention to detail that both the gentle reader and the hardened literary critic should enjoy it immensely.

The book is about reptile smugglers, with a fascinating back story on the community of insanely obsessed private collectors and breeders. From 1989 to 1994 this reviewer was deeply involved in that subculture. As the first few chapters chronicle, it was the business known as Strictly Reptiles that the Feds were going after. What makes this review highly personal is that this was the company I bought all my breeding stock from.

Eighteen years ago I walked away from the herpetocultural lifestyle and mostly forgot about my friends and acquaintances in the industry. This book tells what happened to some of them shortly afterward.

The first chapter describes the arrest of an Argentine national who gets busted with a suitcase full of tortoises. Christy teases us with this little detail of the end game the way a snake would toy with a mouse. Also quite prominent here are brief biographies of a few of the major importers and breeders. Tommy Crutchfield's legal difficulties are a nice juxtaposition to what is happening at Strictly Reptiles. The dotcom bubble of investment grade reptile breeding is eloquently portrayed in the following passage: "In a reptilian version of *Jack and the Beanstalk*, a young Detroit man borrowed from his mother, flew to Oklahoma City, and bought \$50,000 worth of . . . albino Burmese pythons. . . . Four years later . . . [he] and his wife bought a \$1.2 million Florida property. . . ."

The book moves on with the intriguing story of the owners of Strictly Reptiles, Mike Van Nostrand and his father Ray. The absolute obsession of Ray as he is building this business is related through the wonderful storytelling of the author as if he were a first-person observer. Later, after the father is busted for drugs and Mike takes over, we move into the present day. Also in the book is a poignant accounting of the progression of reptile keeping. One cannot help but see how seriously analogous this is to the trajectory of a substance abuse problem. Many hobbyists go through the stages of bigger, cooler, rare and endangered. Ultimately, these incremental steps lead them to the doors of



Strictly Reptiles.

Christy's writing sheds light on the cultural workings of the economic engine which powers the smuggling industry. As the individual and collective needs for more exotic animals grow, the Van Nostrands happily feed upon this lucrative specialty niche. As I have personally observed, Strictly Reptiles on a busy day resembles a high volume crack house.

Also well detailed is the little dance of "don't ask, don't tell" that is played out every day between customer and importer. As most buyers will not purchase animals that were obviously smuggled, a little word game is played. "Captive-born" seems to be the abracadabra phrase that can make thousands of dollars change hands in an instant. Often customers will check rational logic at the door when trying to procure animals they desperately want. "Yes there are only 1500 left in the wild," the buyer will think, "but Mike says they were captive-born in Germany and he's seen the paperwork. That's good enough for me." With a few phone calls the importer makes twenty large and the customer gets a visit from Santa Claus driving a FedEx truck in July.

Intertwined into an already captivating tale is the parallel drama of the U.S. Fish and Wildlife agents chasing the smugglers. Christy has you laughing as he recounts the story of one law enforcement official who, with utter sincerity, tries to convince a prosecutor to take on the case of a guy illegally selling barn owls. He also delves deeply into both the personal and professional lives of the men and women on this case as they approach the holy grail of their careers—busting Strictly. The particular portrayal of one operative is so well concealed that when you learn his true identity you are stunned. Shades of M. Night Shyamalan there.

This book will make you think. If you are an armchair conservationist, it will tweak your mind and perhaps reconfigure your ethics. Personally, I remember Tommy Crutchfield when he explained to me his now famous "conservation through commercialization" philosophy. Throughout the book Christy seems to give some credence to this belief. He also gives us the perspective of the recently captured reptile in a holding pen in Indonesia. Through anthropomorphic literary license he wonders who the animal would rather see: the live animal smuggler or the guy from the boot factory.

This book provides no easy answers and poses morally ambiguous questions. In a world where in a few years the eco-splendor of Madagascar will resemble a Wal-Mart parking lot, what do we do? Are smugglers inadvertently sailing a Noah's Ark for dangerously imperiled species? Bryan Christy doesn't answer these questions, but like the good attorney he was, he lays out meticulously detailed evidence. In his courtroom of the nonfiction genre, he lets you be the judge.

What You Missed at the August Meeting

John Archer
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Roger Repp should be writing this. I told him that. He declined. I suppose that he felt giving the August presentation was enough work, but you've missed out on some really fun writing if you haven't read any of Roger's stuff. Go to the Tucson Herpetological Society's web site and check the archives for some of his output. The effort won't be wasted. He writes a lot better than I. In fact, for many a month after I began writing these pieces of illiteracy, I was frequently begged to "write like Roger," and only the slow realization that I would never scale those reverent heights caused the cajoling to cease.

So maybe you don't know Roger Repp, but you should. He's been a CHS member longer than he'd like to admit, starting in the Chicago area but moving to Tucson some 30 years ago. He is past president of the Tucson Herpetological Society and in his spare time is normally found wandering around the deserts of Arizona in search of animals most people would like to avoid. And he's one of the best speakers we can get. You missed a good talk if you didn't make the meeting in August. Roger's folksy, down-home, aww-shucks delivery is carried into his everyday persona, but that self-deprecation hides a razor-sharp mind that delivers really great quips while doing acclaimed field work. Indeed, Roger has been involved with radio-tracking Arizona rattlesnakes for many years, providing data for several academic papers. And he's a lot of fun in the field.

His talk was titled "Burrow Buddies—Or Not? (Or...What's Up with That?)." Drawn from his many years of peering into holes in the desert, Roger massaged a talk he'd given to the Desert Tortoise Council last year and a talk he'd presented to the Tucson Herpetological Society into a talk for us. We got the



Roger Repp. Photograph by Ralph Shepstone.

best of both worlds. He opened with a shot of a shiny-eyed skunk in a burrow with a Sonoran desert tortoise (*Gopherus morafkai*) and explained that he hadn't seen this often and rarely will both those animals share a burrow. Lifting a line from the '70s hit "A Horse with No Name," Roger made the point that "The desert is an ocean with its life underground," while casting aspersions upon three-chord mega-hits. When you field herp in that habitat you look in every hole. An "aaaww" photo of cute bobcat kittens showed that not all the rewards involve herps.

But he started with occurrences of tortoises and snakes because that was what the Desert Tortoise Council had asked him to cover. With around 2,500 trips involving about 20,000 hours in the field since 1989, Roger has the experience to talk about nearly every aspect of desert fieldwork, and he maintains meticulous notes that allow him to discover he's had 52 observations of tortoises and snakes in the same hole. Stressing that his observations fall within a 50-mile radius of Tucson, he flashed photos of the snakes encountered. A photo of western diamond-backed rattlesnakes (*Crotalus atrox*) in combat illustrated the snake species that accounted for most of the cohabitations, followed by cool photos of the two other species that were observed in the same holes with tortoises, black-tailed rattlesnakes (*Crotalus molossus*) and tiger rattlesnakes (*Crotalus tigris*). Knowing his audience can never get enough of great snake pictures, Roger continued through a list of species that possibly could be found collocated with the tortoises or had been observed by others. We saw slides of Mojave rattlesnakes (*Crotalus scutulatus*), sidewinders (*Crotalus cerastes*) and Arizona black rattlesnakes (*Crotalus cerberus*). Lyresnakes (*Trimorphodon lambda*) filled crevices and pack rats peered from behind their vegetative barriers.



The main interest of the Desert Tortoise Council and what prompted Roger's presentation, a Sonoran desert tortoise (*Gopherus morafkai*). Photograph by R. A. Repp.



The species Roger spends most of his time with, western diamond-backed rattlesnakes (*Crotalus atrox*). Two males in combat. Photograph by R. A. Repp.



In March 2006 these western diamondbacks emerged from their den to drink. Weather: 3 °C, rain/sleet, 50 mph winds. Photograph by R. A. Repp.

A gorgeous slide of several diamondbacks at the mouth of a rocky den was the backdrop for two interesting points. While Roger has found 52 instances of tortoises sharing the same hole with snakes in all of his field experiences, during ten years of radio-tracking efforts he has only recorded two cases of such commensalism. Seems more should have been found, but Roger proposed that the terrain where he typically radio-tracks has many rocky lairs that, while attractive to snakes and Gila monsters, are unsuitable for tortoises because they can't fit and the rocks prevent burrowing. The other interesting point about the slide was the label. Taken in March on a day with rain and sleet and 50 mph winds coming after a long drought, the photo shows the diamondbacks drinking—despite an air temperature of 3 °C (37 °F). Proof that these desert animals will brave extreme conditions when necessary.

At one point Roger mentions that he put in 80 hours preparing his presentation. Some people may have thought that a joke, but I know Roger keeps copious notes and I find that figure totally credible. He broke down his encounters by totals of each species found and then the actions of the observed individuals. Pictures of rattlesnakes hogging the limelight and tortoises skulking in the rear came up. A photo of a single diamondback raised in a combat pose had the label “Bowling for atrox,” and Roger told of the startled tortoise that plowed through a mass of mating snakes to escape Roger's approach, causing the snakes to fly everywhere and the male to take offense and demand snake-on-tortoise combat. The tortoise refused to participate and remained below ground. So many hours of intense study in the



This is what the talk was all about. Photograph by R. A. Repp.



Even though he took this shot, Roger says he has never seen a rattlesnake with a Gila in the wild. He didn't see the rattlesnake until he was looking at the picture days after he took it! Photograph by R. A. Repp.

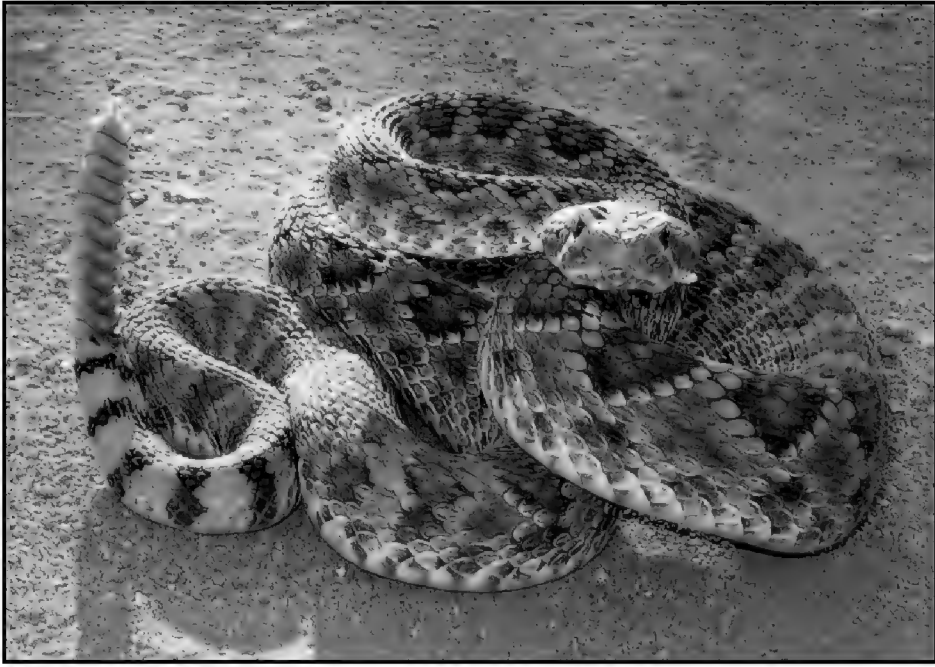
field occasionally exposes one to such dramatic experiences.

The next few slides illustrated another story. A habitat shot of a desert ledge was followed by a photo of a tortoise apparently pinning a black-tailed rattlesnake against the back of a hole. Roger made “gronking” noises as he demonstrated the sound that drew him to this scene. The tortoise was actively attacking the snake in an apparent attempt at ridding the burrow of its presence. The snake seemed to not be taking the hint, and simply shifted a little as the tortoise smashed, rammed and bit. Three hours later when Roger returned, the “gronking” continued and the snake was still intruding.

Roger then expanded his talk to commensalism other than tortoises with snakes and included examples from elsewhere than Arizona. Striped whipsnakes (*Coluber taeniatus*) crowded in with Panamint rattlesnakes (*Crotalus stephensi*), or lazing with a Great Basin rattlesnake (*Crotalus oreganus lutosus*), and another “aaaawww” moment was generated by a photo of four whipsnake heads stacked and peering from a vertical crack. Coachwhips (*Coluber flagellum*) and California mountain kingsnakes (*Lampropeltis zonata*) lit the screen. An Arizona black rattlesnake (*Crotalus cerberus*) and an alligator lizard



A desert tortoise eyes a Sonoran desert toad (*Ollotis alvaria*) at the entrance to its shelter. Photograph by Taylor Edwards.



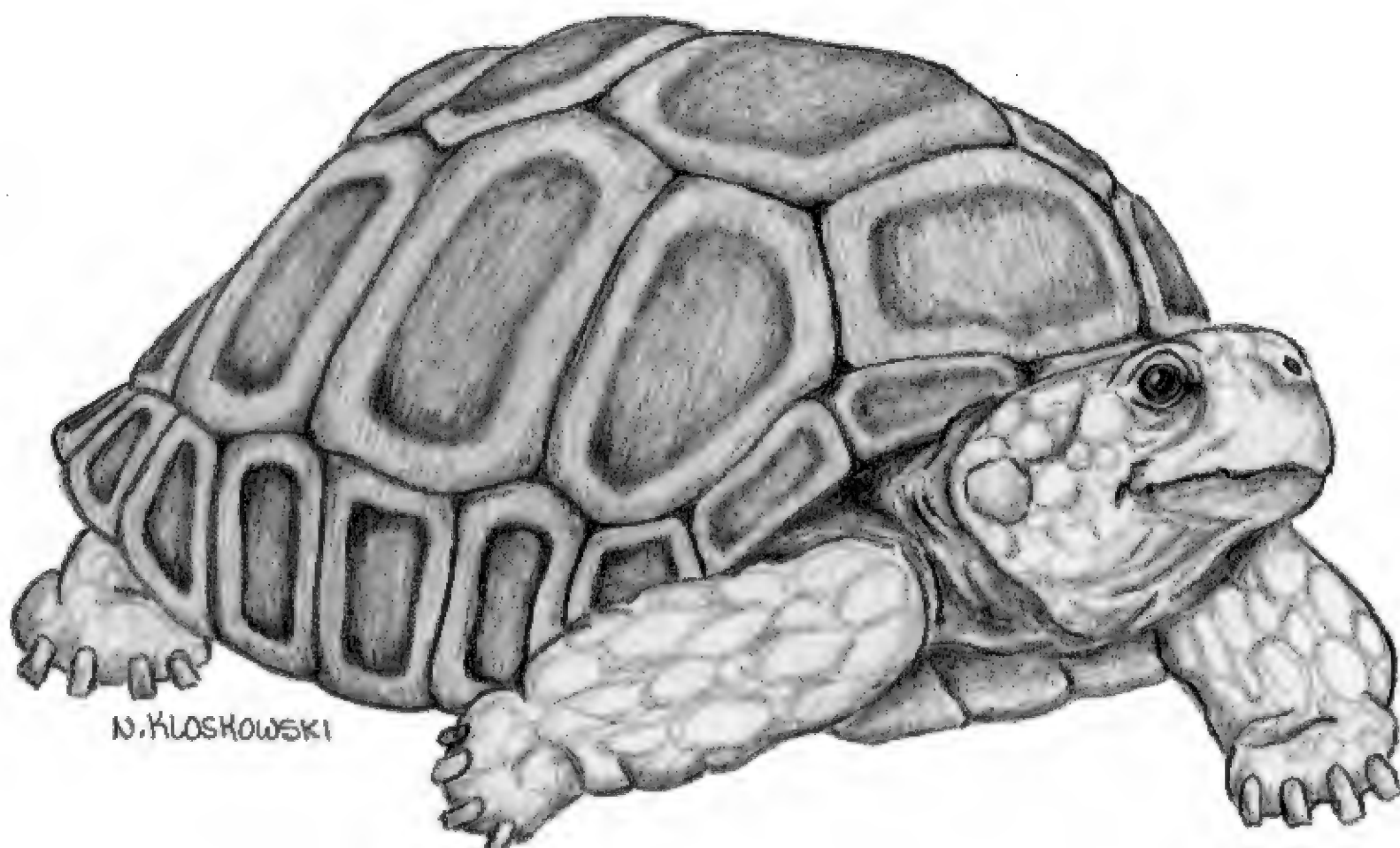
Just a cool picture of a Mojave rattlesnake (*Crotalus scutulatus*).
Photograph by R. A. Repp.

(*Elgaria kingii*) shared a narrow crevice, while Gila monsters appeared with tortoises and snakes. Different species of rattlesnakes were also illustrated as roommates. Roger was building to his question. Many of these animals will eat each other, so why don't they? After tossing out various thoughts and soliciting ideas from the audience, Roger concluded that the animals were in the same holes because, "It may just be that the chosen shelter suits both parties in question" (RAR, CHS *Bulletin* 33(3):49-56, March 1998), and they don't eat each other because of food preferences (herbivorous) or because they can't due to body mass (too large) or temperature (too low to trigger a feeding response).



Gila chillin' (*Heloderma suspectum*).

Early in his Roger's presentation came a slide of a desert tortoise followed by a slide of a Gila monster with a diamond-back, both bearing the label "Nobody here loves these more!" No one who knows Roger would argue that point too much. But to bring the discipline and rigorous observational skills that Roger continually demonstrates requires much more than just a love for the animals. Few people possess Roger's talents, and fewer still manage to use them so fully with such apparent ease. Roger finished with his radio announcer voice while speaking over a slide showing two tortoises in combat, a gorgeous kingsnake, and a pair of strutting whiptail lizards, saying, "This is Roger Repp signing off from southern Arizona, where the turtles are strong, the snakes are handsome, and the lizards are way above average." Certainly at least one of its herpers is also way above average.



Herpetology 2012

In this column the editorial staff presents short abstracts of herpetological articles we have found of interest. This is not an attempt to summarize all of the research papers being published; it is an attempt to increase the reader's awareness of what herpetologists have been doing and publishing. The editor assumes full responsibility for any errors or misleading statements.

ARE REPTILIAN MOMS JUST SELFISH?

L. Schwarzkopf and R. M. Andrews [2012, *Herpetologica* 68(2): 147-159] note that recent discussion in the literature has examined "adaptive maternal effects," defined as maternal effects that benefit offspring, and concluded that this definition is too narrow, because maternal effects may not always benefit current offspring fitness, but can still be adaptive to female lifetime reproductive success. The "maternal manipulation hypothesis" suggests that females modify their physiology and behavior when gravid to increase offspring fitness, an example of adaptive maternal effects in the narrow sense. The maternal manipulation hypothesis has been tested almost exclusively using studies of reptiles, especially viviparous species. The authors argue that interpretations of modifications of female reptile behavior and physiology while gravid are hampered by the maternal manipulation hypothesis' exclusive focus on offspring fitness. They suggest broadening the approach of such studies to attempt to determine whether behaviors benefit fitness of the current batch of offspring, or benefit female lifetime reproductive success, or both. Using this approach, researchers acknowledge that females may modify physiology and behavior when gravid to benefit their own lifetime reproductive success, which may, or may not, also enhance fitness of the current batch of offspring. They recommend tests of benefits to include the idea that females may increase their lifetime reproductive success by engaging in specific behaviors while gravid, independent of (or in addition to) benefits to offspring. They conclude that a broader view of maternal effects, less focused on offspring fitness and including both mothers and offspring, is the way forward for understanding maternal effects.

MANIPULATIVE MOTHERS AND SELECTIVE FORCES

R. Shine [2012, *Herpetologica* 68(3):289-298] notes that in many taxa of squamate reptiles, thermal conditions during incubation affect fitness-relevant phenotypic traits of the offspring. Therefore, a gravid female can enhance the fitness of her offspring by selecting appropriate thermal regimes. The maternal manipulation hypothesis attributes phylogenetic shifts in a broad array of maternal traits (such as nest-site selection, prolonged uterine retention of eggs, and shivering thermogenesis) to selective advantages driven by embryonic developmental plasticity: mothers enhance the viability of their offspring by providing "better" incubation conditions. In *Herpetologica* 68(2):147-159, Schwarzkopf and Andrews pointed out an alternative possibility: that reproduction-induced shifts in maternal thermoregulatory tactics have evolved because they enhance maternal, not offspring, fitness. Shine argues that although possible on logical grounds, this alternative hypothesis is inconsistent with available evidence on squamate biology, especially with the diversity of thermoregulatory modifications induced by reproduction. Most reproduction-associated shifts in maternal thermoregulation likely reflect benefits to offspring, or are nonadaptive consequences of ecological shifts that are enforced by reproduction.

MATERNAL MANIPULATORS, SELFISH MOTHERS, OR BOTH?

D. F. DeNardo et al. [2012, *Herpetologica* 68(3):299-307] note that during reproduction, females often modify their behavior relative to the nonreproductive condition. These changes are frequently attributed to maternal efforts to optimize offspring development and survival (i.e., the maternal manipulation hypothesis). However, Schwarzkopf and Andrews (2012) recently challenged this concept as oversimplified, emphasizing that females should optimize their own lifetime fitness, and therefore maternal efforts may be directed at the female's future reproductive effort in addition, or even in contrast, to current reproductive effort. To provide insight into the relative importance of current versus future reproductive effort in shaping maternal behavior, the authors systematically explore a single study system—pythons. Pythons show distinct maternal behaviors during gravidity (modified basking effort), peri-oviposition (nest site selection), and postoviposition (egg brooding). They argue that examining each component reveals that python maternal effort is predominantly aimed at current offspring. Yet, at times, females will make decisions that benefit their future reproductive potential at a cost to their current effort. Therefore, maternal behavior likely reflects a focused effort to maximize fitness through optimizing current reproductive investment, but such effort is not without consideration of future reproductive potential.

MORE ON MATERNAL MANIPULATION

L. Schwarzkopf and R. M. Andrews [2012, *Herpetologica* 68(3): 308-311] maintain that females should behave in ways that maximize lifetime reproductive success (the "selfish mother" hypothesis [SMH]). Very often, this will mean that female behavior during reproduction maximizes fitness of the current batch of offspring. In some cases, however, females may maximize lifetime reproductive success by behaving in ways that are neutral, or even detrimental, to current offspring fitness. The "maternal manipulation hypothesis" (MMH), proposed by Shine, argues that females should behave in ways that maximize fitness of the current batch of offspring. Schwarzkopf and Andrews argued in the previous issue of *Herpetologica*, however, that if researchers focus solely on measuring benefits to offspring of female behavior during reproduction, they will not consider the possibility that female behavior is neutral or even detrimental to offspring fitness, thereby missing an important facet of behavior during reproduction. Here these authors reply to comments by Shine (2012) and DeNardo et al. (2012), mainly to emphasize the point that contrasting the MMH and the SMH as if they operated exclusively and independently is not productive, because females enhance their lifetime reproductive success by enhancing current offspring fitness or their own long-term fitness, or both.

ORNATE BOX TURTLES IN NORTHWEST ILLINOIS

J. M. Refsnider et al. [2012, *Chelonian Conservation and Biology* 11(1):78-83] note that the destruction of prairies has led to the decline of the ornate box turtle (*Terrapene ornata*) across much of its range. Land management agencies are considering translocation programs to restore populations to areas from which they have been extirpated. For these conservation efforts to be successful, long-term posttranslocation monitoring is necessary to ensure that translocated individuals behave and use habitat similarly to unmanipulated individuals. The authors conducted a 3-yr radiotelemetry study of a potential source population of ornate box turtles to provide baseline data on home range size and site fidelity pretranslocation. Adult males and females did not differ in minimum convex polygon home range size (mean 4.0 ha), 95% fixed kernel home ranges (mean 2.6 ha), or 50% fixed kernel home ranges (mean 0.4 ha). Both sexes showed high site fidelity to annual home ranges and to previously used overwintering sites, although distance between subsequent overwintering sites was less for females than for males. At the study site, ornate box turtles have relatively small home ranges and exhibit strong site fidelity. Translocation programs for this species should closely monitor movements of translocated individuals to assess whether they are successfully establishing new home ranges or attempting to return to their site of origin. Moreover, the high site fidelity exhibited by this species suggests that newly translocated individuals may be at increased mortality risk because they are unfamiliar with suitable overwintering and/or nesting sites in their new location. These results will be used to ensure that sites to which animals are translocated are comparable to the site of origin in terms of home range size requirements and important habitat features. In addition, the data serve as a critical baseline to which the habitat use and movement patterns of monitored animals posttranslocation can be directly compared to assess the success of the translocation.

INSECTICIDE IMPACTS ON PREDATORS AND PREY

J. L. Kerby et al. [2012, *J. Herpetology* 46(2):171-176] examined the combined effects of sublethal concentrations of the pesticide diazinon and a non-native predatory fish on the behavior and survival of amphibian prey (*Pseudacris regilla* tadpoles). A 48-h experiment was performed in tubs containing predatory western mosquitofish and diazinon treatments (0, 0.5, 1.0 mg/L, and a solvent control). In “no-pesticide” treatments, the presence of fish reduced tadpole survival significantly. In the absence of fish, pesticide presence altered tadpole behavior (reduced refuge use) significantly but did not impact tadpole survival. In the combined presence of both fish and pesticide, tadpoles altered their behavior to become more active, and to hide less. Although these behavioral changes should expose tadpoles to an even higher predation risk, because diazinon also reduced both activity and attack rates by the predatory fish, tadpoles experienced significantly greater survival in treatments with pesticides. Despite the negative impact of diazinon on amphibian antipredator behavior, the stronger impact of diazinon on predator behavior allowed a greater survival rate for the prey. These results demonstrate the importance of studying specific species interactions in understanding the impacts of chemical contaminants on any given species.

FASTER BUT NOT STICKIER

P. H. Niewiarowski et al. [2012, *J. Herpetology* 46(2):194-197] note that the house gecko, *Hemidactylus frenatus*, is one of the world’s most invasive vertebrate species and is spreading rapidly across the South Pacific, displacing other species of geckos that are native or were already resident. They studied the adhesion and locomotor capabilities of *H. frenatus* and the resident *Lepidodactylus lugubris* on the island of Moorea in French Polynesia where they are syntopic. The goal was to determine whether *H. frenatus* could stick or sprint faster than *L. lugubris*, two types of performance measures that could underlie superiority of *H. frenatus* in foraging and agonistic interactions hypothesized in other studies. The clinging ability of *H. frenatus* and *L. lugubris* are comparable suggesting that the potential for sticking to vertical and overhanging surfaces as geckos move through their environments does not differ between species. In contrast, *H. frenatus* have maximal sprint speeds that are approximately fourfold higher than *L. lugubris*, an advantage in speed that is even greater than that measured previously for the two species running on horizontal surfaces. Proposed superiority in foraging and agonistic interactions of *H. frenatus* compared to *L. lugubris* are potentially traceable to performance characteristics such as adhesion and locomotion. The authors demonstrate that comparatively high maximal locomotor speeds may contribute to the observed success of *H. frenatus* over resident geckos in French Polynesia, and possibly in other areas where they have been introduced.

OLIVE RIDLEY MASS NESTING ECOLOGY

R. A. Valverde et al. [2012, *Chelonian Conservation and Biology* 11(1):1-11] note that the olive ridley sea turtle (*Lepidochelys olivacea*), a species listed by the International Union for Conservation of Nature as vulnerable, is characterized by its mass-nesting behavior, also known as arribada. For decades, this phenomenon has facilitated the utilization of this species by coastal communities, much of it illegally. At Ostional beach, Costa Rica, a community-based egg-harvest program operates legally to generate important income for the community while promoting the protection of the ridley nesting assemblage. However, to date, no analysis exists that indicates the long-term viability of the egg harvest program as a sound management tool. To address this void, the authors generated baseline abundance data of the major arribada events that occurred in the period 2006–2010, as well as egg harvest data, along with preliminary hatching success. Arribadas ranged between 3564 and 476,550 egg-laying females, which indicated a large variability in the magnitude of the mass nesting events. Estimated mean egg harvest was 4746.4 clutches, ranging from 1527 to 8138. In relation to the estimated number of clutches laid, the estimated mean of clutches harvested was 21.2%, ranging from 1.5% to 102.4%. Estimated monthly mean hatching rates ranged from 0.0% to 32.6%. It is not clear whether arribadas underwent a significant change in abundance during the study period. Although the number of years covered is too short to establish a long-term trend, when compared with historical data the population appears to have declined. Various management recommendations aimed at increasing hatching rates are presented.

STREAM SALAMANDERS AND DROUGHT

S. J. Price et al. [2012, *Herpetologica* 68(3):312-323] note that drought is a significant stressor to aquatic animals. However, empirical data regarding the response of many aquatic animals, particularly amphibians, to drought are limited. The southeastern U.S. experienced a suprasedational drought in 2007–2008, which provided an opportunity to examine the resistance and resilience of salamanders to drought. The authors used 5 yr of presence–absence data at 17 first-order streams and 61 mo of mark–recapture data at one stream to examine the effects of drought on occupancy and vital rates of northern dusky salamanders, *Desmognathus fuscus*. Three hypotheses were tested as to the effects of drought: larvae would decrease in occupancy during drought, but adult occupancy would remain stable; adult temporary emigration rates would be greatest during suprasedational drought conditions; and adult survivorship would be equal or nearly equal during nondrought conditions and drought conditions due to higher rates of temporary emigration. It was found that adult salamander occupancy remained stable through the 5 yr of sampling; however, larval salamander occupancy decreased by an average of 30% during the suprasedational drought. It was also found that adult temporary emigration probabilities were twice as high during suprasedational drought conditions than during nondrought or typical drought conditions. Monthly survival of adults was relatively high during nondrought, typical drought, and severe drought conditions. These findings suggest that high survivorship of adult *D. fuscus* likely buffers the negative effects of drought on larvae and high rates of temporary emigration allow adult salamanders to be resilient to suprasedational drought conditions.

ARTIFICIAL VERSUS NATURAL INCUBATION

K. M. Noel et al. [2012, *Herpetologica* 68(3):324-333] report that recent studies have found that gopher tortoise, *Gopherus polyphemus*, populations in southern Mississippi exhibit low recruitment, due in part to very low hatching success. They sought to determine if the cause(s) of this low hatching success was related to egg quality (intrinsic factors), unsuitability of the nest environment (extrinsic factors), or a combination. In 2003, hatching success was monitored simultaneously for eggs from the same clutches that were incubated in the laboratory and left to incubate in nests. A subset of randomly chosen eggs from each clutch was incubated in the laboratory under physical conditions known to be conducive to successful hatching to estimate the proportion of eggs that were capable of hatching in a controlled setting. Hatching success in the laboratory was compared with that of eggs incubated in natural nests to estimate the proportion of eggs that failed to hatch presumably from extrinsic factors. Laboratory hatching success was 58.8%, suggesting that roughly 40% of the eggs were intrinsically incapable of hatching even when incubated under controlled conditions. Hatching success in natural nests, 16.7%, was significantly lower than hatching success in the laboratory, suggesting that approximately 42.1% of eggs were capable of hatching but failed to hatch due to some extrinsic aspect(s) of the nest environment. Thus, the low hatching success of gopher tortoise eggs in southern Mississippi appears to be attributable to a combination of intrinsic (egg quality) and extrinsic (nest environment) factors.

GOPHER TORTOISES IN A PINE PLANTATION

B. A. DeGregorio et al. [2012, *Chelonian Conservation and Biology* 11(1):50-58] studied long-term *Gopherus polyphemus* population dynamics, burrow distribution, and habitat use at Plum Creek / Lochloosa, a pine plantation in northern Florida. Mark–recapture surveys were conducted on this study site during the 1980s, and a follow-up survey was done in 1992. The ca. 66-ha study area is a mosaic of moderately well-drained and poorly drained soils, and has had a history of clear-cutting. Recent management activities included a tree thinning in 2008 and a controlled burn in winter 2009. The authors located gopher tortoise burrows during late April and early May 2009, and captured tortoises in pitfall or wire traps during May–July. Fifty-two tortoises were captured on the study site and 4 others in an adjacent pine plantation across a paved rural road. Seventeen of the tortoises (33%) had been previously marked, including a male marked as a mature adult in 1982. Most (88%) marked individuals were found in the same approximate location (within 200 m) as during earlier surveys, despite the silviculture-related habitat changes over time. Only 8% of all marked ($n = 211$) tortoises were recaptured in 2009. Recapture rates were 4% for tortoises marked when immature, 10% for adult males, and 21 % for adult females. Drill marks held up relatively well in adult tortoises but were difficult to discern in some tortoises marked as juveniles. Size and sex class distributions of tortoises captured in 2009 were different from those observed during 1981–1987 and 1992, primarily because fewer juveniles were captured in 2009. This follow-up survey indicated that viable gopher tortoise populations can persist on sites undergoing intensive silviculture, and it further substantiated tortoise use of windrow berms, ecotones, and relatively well-drained soils.

DERMATEMYS MAWII IN BELIZE

T. R. Rainwater et al. [2012, *Chelonian Conservation and Biology* 11(1):97-107] note that Central American river turtles (*Dermatemys mawii*) are large Critically Endangered freshwater turtles historically found in the coastal lowlands of southern Mexico, northern Guatemala, and Belize. Due to years of intense harvesting for meat, *D. mawii* has been virtually eliminated from much of its former range in southern Mexico; its status in Guatemala remains unclear. During April and May 2010, the authors conducted a countrywide survey in Belize to assess the current conservation status of *D. mawii* in what is believed to be its last stronghold. Approximately 30 localities were surveyed, from deep southern to extreme northern Belize, including 17 areas previously surveyed during the early 1980s and 1990s. Results indicate *D. mawii* is heavily depleted in most of Belize, but healthy populations remain in a few remote areas, especially those receiving some level of protection. While this mirrors the trend observed in previous surveys, the current findings are of particular concern because the number of localities where turtles were observed and the number of turtles observed at these localities were both much reduced compared to earlier surveys. Large turtles (reproductive adults) continue to be targeted during harvests, significantly reducing the most demographically important segment of the population. Further, interviews with fishermen and hunters indicate that laws and regulations enacted for the protection of *D. mawii* are largely ignored by locals.

Unofficial Minutes of the CHS Board Meeting, August 17, 2012

The meeting was called to order at 7:53 P.M. at the Schaumburg Public Library. Board members Barbara Khan and Aaron LaForge were absent.

Officers' Reports

Recording Secretary: The minutes of the July 13, 2012, board meeting were read and accepted.

Treasurer: The July financial report was presented and accepted. Chicago Wilderness membership is due and will be paid. Printing expenses for the *Bulletin* have been much reduced.

Membership Secretary: Membership numbers are staying around the same. A list of newly expired memberships was read.

Sergeant-at-arms: Attendance at the July general meeting was 35

Committee Reports

Shows:

- Notebaert, first full weekend of each month. Josh Chernoff is coordinator.
- Westmont Pet Event, September 15, 10 A.M. – 2 P.M. We will have a tent or pavilion.
- Blessing of the Pets, Pullman, October 7, 1 – 4 P.M.
- Notebaert (Halloween), October 30.
- Garfield Park Conservatory (Halloween), October 31, 4 – 8 P.M.

Old Business

Promoting articles for the Bulletin: Jason will write an article on preventing fires and carbon monoxide emergencies for herp keepers.

Junior Herpers club: Details are still being worked out. Steve Sullivan will contact the Notebaert to ask for permission to hold the meetings there. November 4, 1–2 P.M. is the tentative first meeting. Jason is still looking for volunteers to help with this.

National Herpetological Society: They are getting a full board together.

Banners: Jason had one banner made and is taking opinions and suggestions before having more made. We also need signs regarding hand sanitizing and sanitizer at ALL events, required by our insurance.

Conservation: Mike found no recent information about DAPTF, so it was decided to not send them a donation at this time. This reduces the donation amount to \$5000.

NARBC, Oct. 13-14: We need to staff our tables during all show hours.

Raffle items: Dick will take over storage of raffle items, and will run the raffle with Josh.

New Business

Herps of Illinois page on our website: Aaron is looking for pictures to update the page.

International Herpetological Symposium: They are hoping to increase attendance by offering two free admissions to each

society which will advertise the symposium in their publication. It will be held in July 2013.

Board meeting site: We will need to start looking for an alternative meeting site.

Reptilefest has a facebook page.

Facebook: Questions/concerns were raised about content on our facebook page. We do have people monitoring the posts on our page.

Awards: Jim Foster is starting to organize the 2012 awards.

Round Table

Nancy Kloskowski's checkered gartersnake had 5 babies—all albinos.

Deb Krohn has a couple of waxy monkey frogs—her son Nick likes them!

Dick: Repticon went well. He ran into the Humberts' daughter Rena on the way home.

Jessica Tschampa has been really busy with art shows. Big news—she is engaged! The wedding date is set for Sept. 28, 2013.

Bob Bavirsha will look into sanitizing posters and bring samples. The fest flyer needs to be updated on the website, and he would like to get cards earlier this year.

Jim Foster was on vacation in Kentucky and stopped at the Kentucky Reptile Zoo.

Linda and Andy Malawy went to Arizona to see their first grandchild, Michael's daughter.

The meeting was adjourned at 9:28 P.M.

Respectfully submitted by Jenny Vollman



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For sale: High quality, all locally captive-hatched tortoises, all bred and hatched here in the upper midwest. Baby leopards, Sri Lankan stars, and pancakes usually available, and are all well-started and feeding great! Leopards are \$125 ea., Sri Lankans (2012 hatched) \$475 ea. And Pancakes are \$195 ea. Leopards for out of state sale/shipping require a veterinary health certificate (inquire for cost). E-mail at KKranz1@wi.rr.com or call Jim or Kirsten at 262 654 6303.

Herp tours: **Costa Rica herping adventures**. Join a small group of fellow herpers for 7 herp-filled days. We find all types of herps, mammals, birds, and insects, but our target is snakes. We average 52 per trip, and this is our 10th year doing it. If you would like to enjoy finding herps in the wild and sleep in a bed at night with air-conditioning, hot water and only unpack your suitcase once, instead of daily, then this is the place to do it. Go to our web-site <http://hiss-n-things.com> and read the highlights of our trips. Read the statistics of each trip and visit the link showing photos of the 40 different species we have found along the way. E-mail at jim.kavney@gmail.com or call Jim Kavney, 305-664-2881.

Line ads in this publication are run free for CHS members—\$2 per line for nonmembers. Any ad may be refused at the discretion of the Editor. Submit ads to mdloogatch@chicagoherp.org.

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UPCOMING MEETINGS

The next meeting of the Chicago Herpetological Society will be held at 7:30 P.M., Wednesday, September 26, at the Peggy Notebaert Nature Museum, Cannon Drive and Fullerton Parkway, in Chicago. **Jeff Lemm**, of the San Diego Zoo's Institute for Conservation Research, will speak on "Rock Iguanas: Conservation of the World's Most Endangered Lizards." In addition to rock iguanas, Jeff's professional research interests include monitor lizards and native Southern California herpetofauna. Jeff also enjoys photographing wildlife and has traveled extensively throughout the world in search of his subjects.

At the October 31 meeting **Gerold Merker**, a private breeder from northern California, will speak to us about rosy boas. Gerold is a co-author of *Rosy Boas: Patterns in Time* and several other books.

The regular monthly meetings of the Chicago Herpetological Society take place at Chicago's newest museum—the **Peggy Notebaert Nature Museum**. This beautiful building is at Fullerton Parkway and Cannon Drive, directly across Fullerton from the Lincoln Park Zoo. Meetings are held the last Wednesday of each month, from 7:30 P.M. through 9:30 P.M. Parking is free on Cannon Drive. A plethora of CTA buses stop nearby.

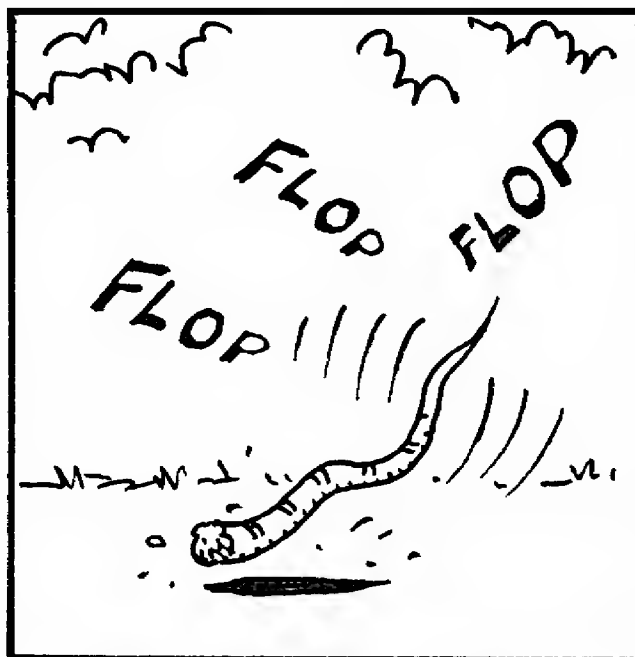
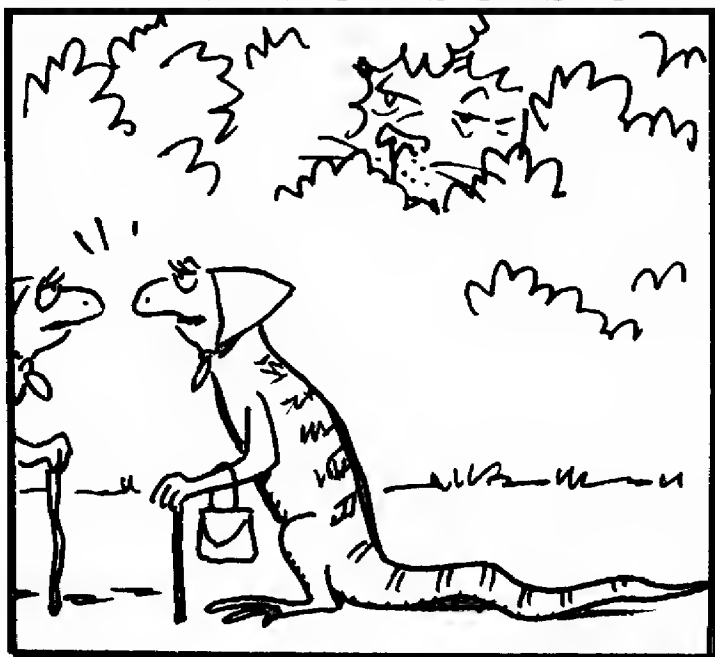
Board of Directors Meeting

Are you interested in how the decisions are made that determine how the Chicago Herpetological Society runs? And would you like to have input into those decisions? If so, mark your calendar for the next board meeting, to be held at 7:30 P.M., October 19, in the adult meeting room on the second floor of the Schaumburg Township District Library, 130 S. Roselle Road, Schaumburg.

The Chicago Turtle Club

The monthly meetings of the Chicago Turtle Club are informal; questions, children and animals are welcome. Meetings normally take place at the North Park Village Nature Center, 5801 N. Pulaski, in Chicago. Parking is free. For more info visit the group's Facebook page.

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October 2012



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Hot Tracks, Fast Turtles—The Unforeseen Consequences of Well-intended Turtle Derbies	David S. Lee	121
What You Missed at the September Meeting	John Archer	131
Unofficial Minutes of the CHS Board Meeting, September 14, 2012		134
Advertisements		135
News and Announcements: 2013 CHS Herpetological Grants Program		136

Cover: Copperhead, *Agkistrodon contortrix*, Jackson County, Illinois, 28 September 2012. Photograph by Stephen L. Barten, DVM.

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The Chicago Herpetological Society is a nonprofit organization incorporated under the laws of the state of Illinois. Its purposes are education, conservation and the advancement of herpetology. Meetings are announced in this publication, and are normally held at 7:30 P.M., the last Wednesday of each month.

Membership in the CHS includes a subscription to the monthly *Bulletin*. Annual dues are: Individual Membership, \$25.00; Family Membership, \$28.00; Sustaining Membership, \$50.00; Contributing Membership, \$100.00; Institutional Membership, \$38.00. Remittance must be made in U.S. funds. Subscribers outside the U.S. must add \$12.00 for postage. Send membership dues or address changes to: Chicago Herpetological Society, Membership Secretary, 2430 N. Cannon Drive, Chicago, IL 60614.

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Hot Tracks, Fast Turtles — The Unforeseen Consequences of Well-intended Turtle Derbies

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... *the race is not to the swift* ... Ecclesiastes 9:11

Maryland Traditions

Despite the previous day's breaking news on a key general defecting from the ranks of the Syrian army, news that thousands of families in the mid-Atlantic states were still without power from a storm that came through the previous week, and the seemingly endless political commentary about the Supreme Court's ruling on the Democrat's controversial health plan, the headline for the Saturday morning edition of the *Baltimore Sun* simply read "104°F." The local radio stations were saying the heat index was expected to reach 111°F. The Chesapeake Turtle Derby was to take place that morning and I arrived early, hoping to talk to some of the folks as they waited in line to register their turtles for the race.

At 9:30 I drove up to the corner of Patterson Park where the race was to be held. There were joggers with headsets, the tennis courts were all in use and on a distant field I could see there was a soccer match in progress. Everywhere there were people walking dogs and pushing baby carriages. Registration for the annual turtle derby was to start at 10:00, but in years past people arrived early to secure a parking place as this had become a popular, well attended, 4th of July weekend event. It was free and open to the general public. I would wait, but it was already beginning to get hot.

The storm of the previous week had taken its toll on a few of the park's trees. Many had lost major branches and three or four linden trees and one chestnut oak had been uprooted. The trunks had been cut up for removal but were still lying about. I entertained myself by trying to count the growth rings on the trees' cross-sections. The chainsaw work for the most part obscured the rings and it was difficult to get a good count. One of the secondary branches of a linden had a clean cut and I counted 72 rings; a recount, yep 72. The trees themselves clearly passed the century mark, and were probably considerably older than that. About 10 A.M. someone drove up, parked their car, and found a shaded place to set up a folding chair near the site where the races would take place. I walked over to inquire about the event. Because of the heat forecast, late the previous day it was decided to postpone the races until later in the summer. Everyone who

inquired about the event and all of those people who registered turtles the previous year were notified by email that the race had been called off. I hung around for another half an hour anticipating disappointed people with their turtles being informed of the cancellation. No one came, and I returned to my car. With the AC running, I circled the park several times expecting to see someone bringing turtles. Although people were still jogging in the 100°F heat, a good way to burn off extra pounds, no turtles; that was it. I headed back to North Carolina, about a six-hour drive on a holiday weekend.

Patterson Park itself has a long and interesting history (Almaguer, 2006). It was an important stronghold in the defense of Baltimore in the War of 1812, and was used as a Union troop encampment and the site of a surgical hospital in the Civil War. Five acres of land were donated to the city by William Patterson for a public park in 1827, and the city added to it with the purchase of additional land. Today the 137-acre park has public recreational facilities, including an ice-skating ring, a small lake and various hiking paths. The initial development of the park was paid for with funds from Baltimore's former streetcar system. Twenty percent of the fares went to the city's park system, and this probably accounted for many of the trees that were planted throughout the park.

I picked this particular turtle race, the 72nd annual Chesapeake Turtle Derby, in part because of its history, arguably the longest continuously run turtle race in the country, and the fact that during my pre-school years my family lived only a few blocks from the park. Based on family photographs the linden trees had grown in the intervening years, but still they had been

of considerable size even back in the 1940s. I recall my sister taking me to one of the turtle races when I was perhaps four. The race is conducted each year in the shadow of the Pulaski Monument near the southeast corner of the park. Casimir Pulaski, a Polish officer who later became a brigadier general of the American cavalry during the Revolutionary War, is one of the most honored people in American history. In a resolution passed by Congress and signed by President Obama in November 2009, Pulaski was given



The 2007 Chesapeake Turtle Derby in Patterson Park. Photograph by Sandra Barnett.

honorary U.S. citizenship (Mann, 2009; Public Law No:111-94). The Pulaski monument depicts a relief sculpture of the general leading a cavalry charge, a fitting monument in that the cavalry unit was headquartered in Baltimore and Pulaski did most of his recruiting there. The monument was commissioned in 1929 but not completed until 1951—even turtles can move more quickly, and fortunately the park’s trees grew faster as well.

Baltimore City Parks and Recreation runs the turtle derby, and it is one of their best-attended public events. Reliving my childhood, I attended the races several times in recent years. Typically about 100 turtles and several hundred spectators show up for the Independence Day weekend’s public event. By late morning there is usually a long line of families waiting to register their sundry turtles. Most have names like Pokey, Myrtle, Speedy, Junior, Booger, and of course Shelly, and many have painted or otherwise decorated shells. The most popular “otherwise” is nail polish. The majority of contestants are box turtles that were captured by parents so their children could enter them. I interviewed the participants in 2008; of the 69 box turtles raced, 89% of them had been captured just for the event, and some families had two or three turtles entered. There are four races, one for box turtles, one for tortoises and one for all other types of turtles, plus a final race where the winners of the three prior races compete for the grand prize. The races are run in heats with the winners advancing to the finals. The racetrack consists of an inner circle into which the “contestants” are placed, and an



A contestant takes a pre-race practice run during registration at the 2008 Bel Air Turtle Derby. Photograph by David S. Lee

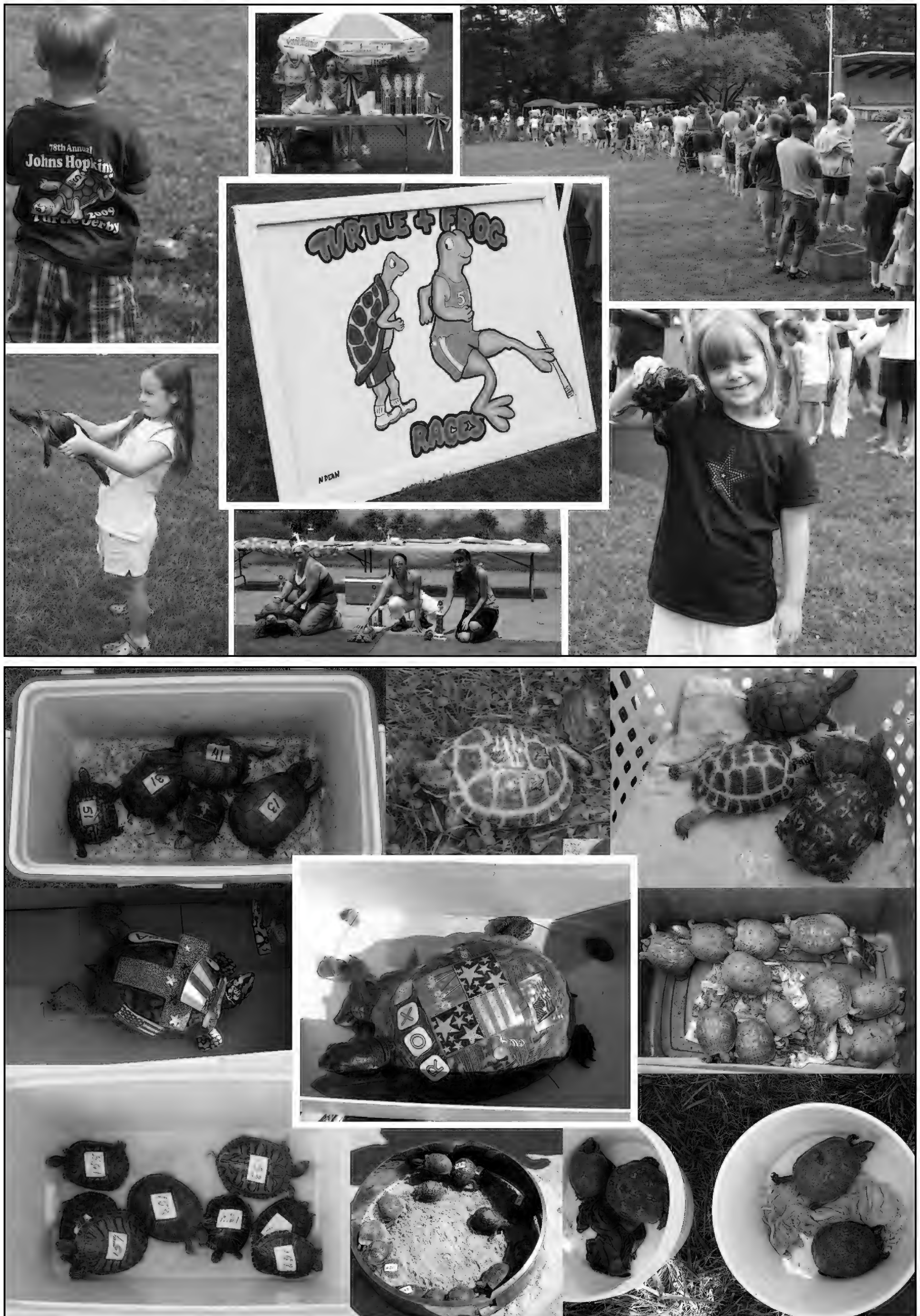
outer circle which the turtles must cross to win the race. After being released into the inner circle, the first turtle to cross the line of the larger outer circle is pronounced the winner. On hot sunny July days the turtles are more than ready to head out, moving like the ones you see crossing highways after a heavy summer rain. Although many don’t move in a straight line, the race is usually over in a minute or so. Trophies are presented to the winners and their proud “owners.” The race is only a few yards (16 feet if the turtles stick to a straight path), but turtles being turtles, there is plenty of time for cheering and shouts of encouragement for the contestants. The “racing” turtles are quite a contrast to the bronze sculpture of Pulaski’s cavalry, or the traffic zipping from stop light to stop light on Rte. 40, also known as Pulaski Highway, just several blocks to the north. Patriotic music is broadcast through speakers as trophies for each category are presented to the winners and their proud “owners.” Perhaps 200 or more people attend the race, with the majority of those being the families that are entering contestants in the race. Happy children and a good summer family event!

A traditional spring prelude to the Baltimore Preakness since 1931, is the annual Johns Hopkins Hospital Turtle Derby. The race, held in May, on the Friday before the Preakness, is run only a few miles from Patterson Park. Over five hundred people attend, many of them young hospital patients hooked up to I.V. machines. Children, some in casts, stand side by side with the hospital’s faculty and staff. In 2000 the derby raised \$3,500 for a “Child Life Program” and a local daycare center that helped children being treated with cancer. Similar amounts were raised in other years in order to help the hospitalized children. This event would probably be the oldest continuously run turtle race in the country were it not for a several year period when the race fizzled due to a lack of staff interest. By 1980 it was back on track, but by my calculations this leaves the Patterson Park race as our longest continually running annual turtle race.

Just up the road, another 4th of July race is organized by the patrons of the Bel Air Independence Day Committee. It attracts a similar audience, including people from nearby states. The rules are similar. Typically over 100, and in some years up to 200, turtles are entered. In the recent past nearly all were native wild-caught box turtles. By 2008 when I first attended this race, only 56% of the turtles were eastern box turtles, and still in 2012 only 57% of the 130 or so entries were box turtles. Box turtles are becoming increasingly hard to come by. In addition to eastern box turtles, locally captured diamondback terrapins, eastern mud turtles, red-bellied turtles and feral red-eared sliders were entered in the race. A few animals were purchased in local pet shops the week before just so children could enter a turtle. In 2008 they included one ornate box turtle and two Russian tortoises. Interestingly, one of the Russian tortoises had an American flag painted on its carapace; a most patriotic chelonian, I suppose. Clearly the Cold War is now over. Two pet African spur-thighed tortoises were also entered. The event was preceded by hamster races and immediately followed by The Great Bel Air Frog Jumping Contest and Watermelon Eating Contest.

So how common and widespread are turtle races?

These are the three major turtle racing events in just the



(photographs by David S. Lee and Sandra Barnett)

Baltimore area. Each year there are hundreds of turtle races taking place throughout the country. Almost every state has various towns and organizations sponsoring turtle races. Typically they occur around the 4th of July, but they also are held concurrently with other outdoor summer activities such as county fairs. Just reading through all the turtle racing events that come up on a web search or watching all the ones that pop up on Youtube would probably take days. The races do not seem to be clustered in any particular region of the country. A number of the events date back 40 years or more and appear to be continuing annual events. Even the Indianapolis Zoo has them; this year they held their 31st Annual Zoopolis 500.

The actual number of turtle races conducted annually in this country is difficult to estimate. Heeb (2007) reported annual races occurring in 35 states, totaling 520 events. This number is conservative as it does not include the smaller, informal, less advertised races, so the actual number could easily be twice that. One problem in trying to estimate the number of individual races is that some towns run races on a weekly basis throughout the summer. I know of no races in North Carolina, but this does not rule out small-scale backyard events. In a number of states there are multiple races sponsored by various towns and organizations. Some states, Kansas and Missouri for example, have 40 or more different races taking place every year. Oklahoma has 28. Informal races in bars and other establishments are impossible to track. But if we assume there are 520 major races per year with an average of 50–100 turtles per event, that's a lot of turtles, perhaps rivaling the nation's pet trade in the number of box turtles taken from the wild each year. Based on the number of entries at over 50 races, Heeb (2007) estimates 26,000 box turtles are taken from the wild each year for use in these races. If one adds to that road mortality, habitat fragmentation and loss, effects of pesticides and other contaminants, mortality from mowing, people taking turtles home as pets, predation by pet and feral dogs, increases in populations of human subsidized predators such as raccoons, and the continued commercial trade, the number of box turtles lost per year to human-related activity is phenomenal. The combined toll is now threatening what not too many decades back were common species.

It was not until I started digging into all this that I became aware of an important aspect of turtle racing. Bars and taverns often use these events to entertain customers. Throughout the country, bars hold turtle races; some are nightly, others weekly. There are many variants of this activity, but typically patrons get a ticket with each drink they purchase. They can then use these to place bets on particular turtles to come in first or last place. The winners are rewarded with tee shirts or more drinks. In most cases it is not clear if the customers need to bring in their own turtles to race in these events. A few bars state you can rent turtles if you forgot to bring one. Online videos of some of the races indicated that the turtles used were mostly box turtles and red-eared sliders. Based on the behavior of the crowds the events generally take place late in the evening, apparently in an attempt to keep the patrons in the respective establishments. I was surprised to learn that the Turtle Kraals Restaurant and Bar in Key West, a site I reported on earlier (Lee, 2012), now holds turtle races. This appears to be a new and growing trend; bars throughout the country have started running turtle races. This

bar game fad can now be found from Florida to Chicago, and Houston west to L.A.

The history of prize money and betting on turtle races goes back to at least 1924, when races started in Kay County, Oklahoma. Within a few years, thousands of "terrapins" (box turtles were often called "highland terrapins" at the time) were being entered in the race and by 1930 first prize winnings exceeded \$7,000. The races ended in 1931 when the "terrapin derby" was ruled to be a lottery (Anonymous, 1960). About the same time Boston police raided a street carnival where five men were caught and later fined for racing 13 turtles. The prizes were boxes of candy. Police confiscated the candy but not the turtles (Anonymous, 1930).

The issues

I thought about all the sundry issues on the drive home from the postponed Patterson Park race; basically they fall into four major categories. Their relative importance depends on one's perspective.

Native box turtle populations: Box turtles, by far, are the turtles most often used in turtle racing. Multiple studies throughout their range show that box turtle populations have been in decline since the 1950s (see summary in Ernst and Lovich, 2009). Like most other turtles, box turtles exhibit strong site fidelity and typically have relatively small home ranges, ones they seem compelled to return to if they are released anywhere except at their site of capture. In a several year attempt to repatriate box turtles in Pennsylvania, radio-tracked turtles wandered away from the release area, and over 60% of the individuals failed to establish new home ranges (Belzer, 2002). Cook (2004) introduced 337 box turtles to a 579-hectare site in Brooklyn, New York. The area was a former salt marsh that had been filled in during the 1920s. Over a seven-year period only half of them established home ranges; the others were unable to establish territories, or simply wandered off the site. Research by others has shown similar problems and emphasizes that displaced box turtles are unlikely to survive (Hester et al., 2008). How strong is this homing instinct? I have seen pet box turtles that had been maintained in outdoor pens for years, later released miles away into appropriate habitats, and within weeks found by their owners pacing the outside of their former pens trying to get back in.

Dodd (2001) and Ernst and Lovich (2009) provide excellent overviews of population studies of box turtles. It is not uncommon for box turtles to reach ages of 60 years or more, and individuals have been known to live well past the century mark. All studies of wild turtle populations show that there is no support for a sustainable use. Perhaps the most compelling statistical model showed that a 95% annual adult survival rate is needed for a stable population of ornate box turtles (Doroff and Keith, 1990), thus if only one adult box turtle was removed from a sizeable and healthy population per year, over time the population would crash. Nazdrowicz et al. (2008) discuss the nature of box turtle populations in fragmented landscapes, the types of habitats that typically serve as a source for turtles used in races.

Another consideration is the timing of these races. After a threat to close down one 4th of July race in Pennsylvania

(Moore, 2012), concerned parents of children who planned to participate in the event wrote in to say that the children who had started collecting turtles around Memorial Day would be disappointed. Thus, it seems that many of the turtles used in these races are held captive through a major portion of their prime egg laying period. In fact, gravid wild-caught box turtles have shown up at the Patterson Park derby more than once, and a gravid diamond-backed terrapin laid an egg on the race course in 2003. Heat is another issue for midsummer turtle races, many of which are run on asphalt, and even on natural substrates midday ground temperatures can easily reach 102–125°F.

Many of the turtle races run today were started back in the mid-1900s when box turtle populations were much healthier and the landscape was less fragmented. While individual turtles can persist for decades if their core home range remains intact, these relict individuals do not represent sustainable populations. Most of the turtles that are being entered into races are not just older than the participants entering them, but some likely date back to a period prior to the founding of the particular annual event into which they are being entered. Just as in the Bel Air race, as box turtles have become harder and harder to find, other species of turtles have started showing up as contestants. Some of these are locally captured, while others are purchased in pet stores just for the event, or represent turtles and tortoises that are family pets. The Johns Hopkins race is now run with turtles rented from turtle farms and biological supply companies. In doing this, they do not need to have the turtles examined or the race approved by an animal use committee. That the Hopkins race has shifted to renting turtles from turtle farms for their annual race has nothing to do with conservation concerns for local turtle populations; they were forced to do that as native box turtle populations in the greater Baltimore area became almost non-existent.

Human health risk: In that considerable numbers of young people attend these events, and the children entering turtles in the races by the very nature of the event are handling the turtles, *Salmonella* infections are always a concern. *Salmonella* bacteria and other pathogens are not just on small turtles as might be implied by the federal law prohibiting the sale of turtles under four inches. In that the turtles are confined to the same small areas prior to the races, the potential for transmission of disease from one turtle to another is substantial. In addition, the turtles often then go back home with the participants' families, where children have further contact with the turtles. I have not seen any indication that the organizers of these races have even considered this issue, as there are not printed alerts to the potential problem handed out at the events. Furthermore, hand sanitizer is not typically made available to the participants, nor do families normally bring any. C.D.C. news releases, which for the most part focus on illegal sales of "baby" turtles, to date have overlooked turtle races that, in reality, provide the setting for mass contaminations and regional outbreaks of *Salmonella*.

While the issues caused by transmission of *Salmonella* from turtles to people are well known, *Campylobacter* is another serious bacterial infection that be transmitted by handling turtles. It can result in serious gastroenteritis, diarrhea, abdominal cramps, nausea, and fever. There are cases of adults, children and infants becoming infected with *Campylobacter* after expo-

sure to wild-caught box turtles that became family pets. As with *Salmonella*-infected turtles, these likewise fail to exhibit symptoms of the infection, but they can serve as a reservoir and periodically shed the bacteria (Harvey and Greenwood, 1985; Johnson-Delaney, 2006). It is interesting to note that the 4th of July Bel Air turtle races are followed by frog-jumping and watermelon eating contests. I have seen no effort to have the children participating in the events sanitize their hands between any of the contests.

Humanitarian and health concerns for the turtles: From the turtles' perspective inhumane treatment is also a consideration. Turtles are often captured weeks prior to these races and retained in makeshift containers. Five-gallon plastic buckets seem to be the housing of choice, as families have no clue as to the needs of their captives. The people holding the turtles often have no more idea of how to care for them than they would an orphaned songbird or a potted orchid. One year at the Patterson Park race I had the opportunity to examine 10 eastern box turtles that had been captives for six months or more. About half of these showed external health issues such as overgrown beaks, eye problems and ear infections. When these turtles are offered food in captivity, the food items presented are usually ones the turtles fail to recognize as edible. It is apparent that many of the confinement containers, used to both house and bring the turtles to the events, are seldom cleaned. Some turtles are left to over-heat in locked cars or the backs of pick-ups, and the creatures are often stacked together before and after the races. Turtles are frequently left in full exposure to the summer sun for hours on race days. It's hard to think of turtles, with their deliberate movements and protective shells, as stressed, but when moved about turtles do become stressed, and at such times internal parasites and diseases begin to take their toll. It is interesting, that of all the issues raised about turtle races on internet sites, the humanitarian ones are the most often discussed, but solutions are seldom proposed.

While the exact avenues of disease and parasite transfer in turtles are not well understood, contact by both people and turtles with unhealthy individuals is obviously something to be avoided. Many illnesses are due to transmissible infections, and turtles can infect each other even when only briefly brought into close contact. Bacteria-caused abscesses, eye and respiratory infections, and shell rot are commonly encountered in captive box turtles. Both bacterial and viral ear abscesses (Holladay et al., 2001) as well as respiratory diseases resulting from microplasma (Feldman et al., 2006) are well documented in wild and captive box turtles. In 2008 several cases of ranavirus were detected in wild box turtles in Maryland (Shaver, 2012). While the mode of transmission of the virus is not definitively established it is suspected to result from contact with infected animals. This is a serious disease; it develops quickly and is untreatable. It has killed both wild and captive turtles and tortoises in a number of states (De Voe et al., 2004; Johnson et al., 2004, 2007; Allender et al., 2011; Allender, 2012). Turtles that are exposed to ranavirus at racing events and later released would not only have the potential to spread the virus into wild turtle populations but they could also contaminate native amphibians. The virus has been documented in both larval and adult salamanders and frogs.

Parasite transfer varies with the type of parasite, but box turtles, even healthy ones, typically are hosts to numerous types of external and internal parasites. Stuart and Miller (1993) examined 117 box turtles from North Carolina and found nine species of helminth parasites. For some species of parasites there were 76–83% infection rates in their sample. A good summary of the diseases and parasites of box turtles is presented by Dodd (2001).

Staff overseeing turtle derbies would be wise to check animals at registration for swollen eyes, nasal discharge and obvious infections. Having a veterinarian with experience in reptile diseases on-site is something the sponsors of turtle races should consider. The issues are exacerbated by the fact that often many species of turtles and tortoises are brought to these events: long term family pets, wild-caught, captive-bred, and recent pet shop purchased animals, many with unknown histories, all come in contact during these events. Fecal material on the plastrons of the turtles, and exposure during pre- and post-race contact could result in establishment of new parasitic faunas in the turtles. How will this affect native populations of any number of turtle species if the contestants are released back into the wild?

Release of turtles after the race: Unlike many states, Maryland regulates against turtles held in captivity, or ones coming in contact with other captive turtles, being released back into the wild. This regulation is the result of the recent discovery of ranavirus in wild box turtle populations in that state. The regulation is nearly impossible to enforce and most people are totally unaware of it. In an ideal world, a quick release at the site of capture immediately after a race would be the logical solution. But people often release the turtles at sites of convenience, and most are totally unaware of their actual habitat needs. This is all compounded by the fact that the turtles may have been exposed to various diseases and parasites from other turtles participating in the event. Eighty-four percent of the box turtles and 50% of the other turtle species entered in the 2012 Bel Air Race were wild-caught, and many families said they would release the turtles after the race. Most participants failed to follow the advice of the Department of Natural Resources not to use wild-caught turtles, and not to release turtles back into the wild. This may be a total coincidence, but several years back, a day after the Patterson Park races, I saw a number of box turtles wandering about on a two-lane country road just east of Baltimore. It was the closest extensive rural setting outside of the city. It was early July, and there had not been rain for some period. Were the turtles simply dumped there by the race participants as they drove home the previous afternoon? It seems likely that the painted turtles and red-eared sliders living in the Patterson Park lake are ones released from former turtle races. In the 1960s there were only a few documented records of feral sliders in Maryland (Harris, 1969); today they are widely distributed in the state. While releases of unwanted pets from a disposable pet market certainly are responsible for most of the state's feral slider populations, turtles released after races likely account for redistribution and establishment of additional populations.

As urban growth expanded into the counties surrounding Baltimore, box turtles have all but disappeared from the landscape, and race participants often are forced to acquire their

animals through pet stores. Lee and Smith (2010) reported on a Russian tortoise that showed up at the 4th of July turtle races in Bel Air, Maryland. Among the 100 or so box turtles that had been gathered up for the event there was one very unhealthy Russian tortoise. A parent had purchased it earlier in the week for her son to race. They had not considered what they would do with it after the race, and thought it would be best if they simply released it somewhere. So not only was the stage set to introduce all sorts of Old World bacterial and viral infections to the turtles participating in the race, but into the wild as well. I have since learned that Russian tortoises are regularly entered in turtle derbies. I, and others, have seen them on a number of occasions in the various Maryland races. This species is commonly sold in the large chain pet stores and parents looking for a turtle for their child to race simply purchase one. These small tortoises are often raced in "heats" with box turtles. This is unfortunate. Wild-caught Russian tortoises commonly carry herpesvirus and lung and gastrointestinal parasites that can be transmitted to other turtles and tortoises. Infected tortoises can appear asymptomatic.

And: Then there are the totally unexpected issues, ones that could not even be predicted with a crystal ball. About a decade ago one family showed up with their turtle and registered it just prior to the Patterson Park race. It was a bog turtle, a species protected in Maryland, at least on paper. The people running the race simply entered it in the "all other types of turtles" category, but the parents became rather nervous when a few of us told them about the legal status of the species. They and the turtle disappeared sometime before the start of the race. I have always wondered what became of the animal.

Barnett (2010) presents a similar set of concerns regarding issues with turtle derbies and concludes that these turtle races serve no useful purpose and are very detrimental to the turtles on a number of important levels.

Are there solutions?

It would be difficult to collectively manage turtle races as they are individually run by a wide array of independent organizations, town chambers of commerce, and county governments. Often they are sponsored by civic clubs, churches, local dog rescue organizations, and hospitals, and some have become important for raising both funds and awareness for various admirable causes. Many are coupled with state fairs, holiday celebrations, parades, carnivals, and beauty pageants. In most cases they are family oriented local events that span several generations. Many are considered an important component of small town tradition.

Before some nincompoop suggests that perhaps children entering turtles in these races and participating in these events in later years will become instilled with an interest in reptile conservation, let me state that that same thought has already been proposed as a justification of commercial sales of wild-caught reptiles at reptile shows (Smith, 2006). I think this argument to justify reptile expos has been adequately addressed (Lee, 2007). Do children attending horse races develop an interest in becoming stable keepers and ranchers, or stewards of open spaces where wild horses can run free, or do they simply become ad-

dicted to horse racing as a social event or perhaps to the betting?

Regulations: Most states have no regulations that prevent turtle racing. State regulations as they relate to box turtles are summarized by Dodd (2001) and Franklin and Killpack (2009). While many states protect box turtles, and some prohibit the capture of turtles from the wild, and others do not permit commercial use (Nanjappa and Conrad, 2011), public and well-advertised turtles races continue to occur in many of these same states. There are a few examples of actions taken by regulatory agencies. In London, Ontario, 100+ native turtles were confiscated and released back into the wild days prior to a turtle race that had been run for the previous 36 years. The event continues, but now only pet store turtles are used in the race (O'Brien, 2010). Regulations by the Ontario Ministry of Natural Resources state that it is illegal to hunt any wild turtle in the province. Moore (2012) reports on a turtle derby that had been held for nearly 50 years in New Berlin, Pennsylvania, that was threatened to be closed down by the Pennsylvania Fish and Boat Commission. The Boy Scout troop that runs the race was notified that eastern box and wood turtles, along with four other species, had been on their no take list since 2007. Race participants arriving with any of these turtles could be fined \$250. Based on the online comments and letters to the paper's editor, people were quite upset with the possibility that this traditional hometown race would be closed down. The Commission responded to the Boy Scouts' concerns with mixed messages and statements like "there were no plans to have officers issue citations." The race was run as scheduled but participation was far less than in previous years.

The Maryland Department of Natural Resources (2012) released an advisory about the use of wild turtles in turtle derbies a day before the 4th of July races in Bel Air, Maryland. They cautioned that the races pose "a potential health risk to the turtles involved, to wild populations into which they may be released, and to human participants." This press release states that ranavirus was found to be affecting wild turtle populations in Maryland, and cites the Centers for Disease Control and Prevention's concerns with *Salmonella* outbreaks. No actual state regulations were cited that preclude turtle races, but the news release did remind people that there are laws against releasing any reptiles or amphibians that have been held in captivity back into the wild. The message was about turtle and human health issues, and nothing was mentioned about the drain on native turtle stocks, an especially important point in that Maryland law prohibits their release back into the wild after the race.

Ideally, state and federal wildlife regulatory agencies could, like courts and law enforcement agencies, be free from political pressures and just do what is right. The Migratory Bird Treaty Act ratified in 1918 is very effective in protecting native non-game birds, and prohibits their misuse. For nearly a century this act has had the complete support of the American public. Could not a similar act be created for native reptiles and amphibians? In that the state of North Carolina protects all of its native species of rattlesnakes, surely bills worded to simply prohibit the foolishness that continues to be allowed with less formidable native reptiles could gain popular support. Road mortality and habitat loss resulting from development will continue to be a

major threat to native turtles in general, and box turtles in particular. While it is unlikely that much will change on that front, turtle races and the commercial pet trade are nevertheless major negative drains on populations, and they could be quickly brought under control by our regulatory agencies.

Education: Despite the number of turtle races that are held each year in North America, and the numerous issues they present, the topic remains low on most people's radar. Major reference books on North American turtles (e.g., Ernst and Lovich, 2009) fail to discuss box turtle racing, and even ones specifically addressing just box turtles (Dodd, 2001; Franklin and Killpack, 2009) mention turtle racing only in passing.

Groups sponsoring these events and the general public need to be informed about the various potential and real issues with turtle races. Simply shutting down races infuriates many people, and a major educational opportunity is lost if the situation is not properly presented. This would be a good activity for regional herpetological societies and local turtle clubs to address. Meetings with event organizers and state wildlife officials could at least make everyone aware of the problem. Media releases and educational flyers to hand out at the events would allow people participating in the races to understand the health and conservation problems that these events can create. Sellers and Lee (2012) outlined a program where high school biology clubs could create proactive awareness programs to discourage local illegal sales of hatchling pet turtles to the general public. Perhaps similar programs could be developed regionally for turtle races. Conservation organizations could address the issue by preparing published guidelines for organizers of these races and offer alternatives to the ways in which races are currently run.

The ethics of stewardship need to be ingrained in the public. Providing information about the issues resulting from the use of box turtles in these races, creatures that are as likely to be as old as the children's grandparents, would be a good opportunity for promoting the importance of local land stewardship. Presentations at the race events could be important in educating the public about native turtles and their conservation needs.

Alternatives: If you must have them, there are other ways to run turtle races. At the Johns Hopkins races they "rent" turtles from an out-of-state turtle farm or biological supply house and then return them. In Ottawa, the turtles are borrowed from a local pet store. Both methods at least eliminate the take of turtles from the wild, and the potential contamination of personal pet and wild-caught turtles from exposure to disease. Permanently marked and registered turtles could be maintained by families throughout the year and used in subsequent races. In that box turtles have unique markings, identification photos could be taken and retained by the organization hosting the event. Pet turtles could be pit tagged for identification; the cost of the tags could be part of a registration fee.

While the option of retaining the same turtles and using them for races year after year sounds better than some alternatives, this may not be the case. For inexperienced owners, box turtles in particular are difficult to maintain in captivity. Simple setups as seen in pet shops are little more than live storage containers, and the animals do not fare well under these conditions. Turtle

rescue organizations are constantly given box turtles with all sorts of health issues from families who tried to keep them as pets. Smith (2011) put together a video showing some of the problems created by inexperienced people keeping box turtles as pets. The turtle shown at the 2:16 minute mark is one that has regularly shown up for the last several years at the Patterson Park race. Attempts to educate the family overseeing its care have not been successful. In the early '80s, the museum where I worked had a "lets bring nature to the class room" program. Live box turtles were one of the major components of the program. Not only did they not do well in simple setups in classroom settings, but there was a high mortality in the demonstration turtles kept at the museum. Eventually the museum hired a professional animal care staff just to oversee the education department's animals. The real downside of the program was the fact that school children all over the state, on seeing the box turtles bumping about in their 10-gallon classroom aquariums, would want one too. I wonder how many adult box turtles were removed from the wild as a direct result of this single ill-advised aspect of the program.

The organizations sponsoring the Maryland races have few restrictions other than the actual rules of the race itself. Okay, snapping turtles were banned from one of the races. At the various races I have attended, no informational handouts were provided to participants. The program for the 2012 Independence Day Celebration in Bel Air states "Pursuant to Maryland Department of Natural Resources restrictions on turtles captured in the wild, no turtle may be entered whose carapace is less than 4 inches long. Limit 1 member of each turtle species [box, painted, red-bellied, etc.] per adult. 3 turtle limit per entrant." The regulation itself is actually aimed at *Salmonella* issues and commercial sales of turtles less than four inches; nothing is stated against owning a small turtle, or racing one, but you are not allowed to release it afterwards. There clearly needs to be some communication between organizations sponsoring these races and the state and federal agencies overseeing our native wildlife. Likewise, regional nature centers, turtle clubs and local herpetological societies need to prepare educational handouts about native turtles and wildlife regulations and include some dos and don'ts that would address the major concerns of local turtle races.

Perfect solutions are limited, and perhaps nonexistent. The best bet would be doing away with the events all together. Keep in mind that many of the races are held in the name of important causes, while others are summer events attracting much-needed business to small rural communities. The two obvious courses of action are educating the public about the problems that these races cause for native turtle populations, and then demanding that the organizations sponsoring the events address the issues. Pre-registering turtles of known origin for the races to ensure that they were not taken from the wild just for the event would be a start. Renting turtles from turtle farms, as is being done in the Johns Hopkins races in Baltimore, is another solution. Neither of these solutions, however, address the potential human health risk, the concerns that have been expressed regarding disease and parasite transfer, or the stress placed on the turtles.

In 1998, Florida began protecting gopher tortoises, and towns and cities sponsoring gopher tortoise races switched to

mechanical tortoises. There are now "mock" tortoise races in Panama City and San Antonio, Florida [<http://rattlesnakefestival.com/gophers-races>; and <http://www.youtube.com/watch?v=y+88gawEUOo>]. The annual events continue to draw sizable crowds. Even the practice of rounding up rattlesnakes for the San Antonio Rattlesnake Festival has become a thing of the past. Another alternative is substituting some other event for a similar one that does not involve wildlife. One successful alternative activity has been rubber duck races, where numbered rubber ducks are released, for example, in a stream, and the first toy duck that floats past the finish line is the winner. This has been formally suggested by PETA as a cruelty-free substitution for turtle races (Daubs, 2010).

Once I learned that the Patterson Park race had been postponed to an as yet determined date in September, I headed back home to North Carolina. It was the 4th of July weekend and the traffic between Baltimore and Richmond was stop and go all the way; it was an Interstate, but often I found myself moving at only 10–20 miles per hour. For some reason the AC does not work on my hybrid at low speeds, and even with it cranked up to the highest setting it was still hot. Once clear of the Richmond/Petersburg congestion, everyone was back up to speed and truckers were making up for lost time. And then the car overheated. I managed to make it to a rest stop and opened the hood, only to realize that even though I have had this car for over 6 years, I did not have a clue as to how the cooling system worked on a hybrid. I checked the fluid levels; all seemed fine. Within an hour I had the car running again. I am not sure what I did, maybe my Ford Escape just has a mind of its own. To prevent the engine from overheating again, I drove the last 150 miles in what was clearly the hottest day of the year, perhaps a decade, with the AC turned off. Annoying, and inconvenient, but it seemed like the best solution for making it back home. Maybe it was the heat and my mind was not working right, but what is it about turtle races? I get horse racing, motor speedways, and dog tracks. Maybe it's not the speed per se, but our addiction to sporting events, competition, rooting for persistent underdogs, or betting. Only by adding the key ingredient, really silly, can the growing success of turtle races be explained. Perhaps this is the direction to explore in looking for alternatives to turtle races. Could this grow into virtual turtle races on computer screens, or maybe Aesop's idea of interspecies races like ones between obstinate tortoises and swift hares would finally catch on? Snails, slugs, inchworms, and shopping carts might all make good contestants. How about swift boats? Here is an idea: one could race numbered turtle eggs as they rolled down an inclined plane. With a cushioned finish line infertile eggs could be raced for years. And if that would create too much excitement, for say people in retirement villages, one could hold turtle egg hatching races. Number the eggs and bet on the order that individual eggs would hatch. Or as the turtles hatch out announce the egg's number and fill in bingo cards.

Would I return for the September races? I was not having my best day and perhaps this was not the time for me making such decisions, but probably not. And then I thought of the 50 or so box turtles that would be sitting about in cardboard boxes in hot garages for the next two months. Most people would have no

clue as to how to care for them, and then what? Once raced would the turtles be released? September is just before the onset of hibernation, and is probably one of the worst times for a box turtle to be looking for home. Oh, that's right, they can't be released—Maryland has regulations about such things. Maybe they can just go into training and someday we will be watching these very turtles trying out for the Turtle Olympics. Somehow, the annoyance of the overheated car and my perspiration issues began to seem to be rather minor in the scheme of things.

How can one put this injustice into a perspective that the general public will understand? Almost everyone has admiration for age and time. Here was Patterson Park, a site that played an important role in three wars that set in place the very existence of this country. And then too there were the park's trees, most well past the century mark, and the tens of thousands of inner-city children that throughout this time period came to value green spaces because of Patterson Park. And then we have the turtles—many of the ones being raced are older than the grandparents of the children attending the event. Turtles whose own grandparents roamed the once-forested areas surrounding the city as bombs were bursting over Baltimore Harbor in 1812, creatures that themselves came from parents hatched during the American Revolution. These descendants are used in the races for the one- or two-hour event recognizing Independence Day, and then become disposable objects. There is no regard for their needs in a rapidly changing landscape; seemingly our compassion for life does not extend to turtles. These races need to be converted into educational opportunities, lessons that teach respect for the local creatures that share our lives and our history. Conservation concerns need not be limited to polar bears and whales.

The real race, it seems, is to save local turtle populations from this well-intended nonsense. This is not something that needs further study, or detailed quantified analysis, it's common sense. We are dealing with threats to individual turtles, to exist-

ing turtle populations, and the exposure of both native turtles and amphibians as well as people to a number of highly contagious bacterial and viral diseases. Just recognizing the likelihood of the races becoming agents for spreading transmittable diseases through both wild and captive turtle populations should be a major concern. With luck, natural resource agencies, or event organizers can come up with practical solutions in a more timely fashion than the city of Baltimore took to finally erect its monument to Pulaski. But the first step is the need to recognize that these races are a problem.

And I am sorry, it was not my intent to leave you in total suspense. In 1777 during the Battle of Brandywine, Pulaski both changed the course of the Revolutionary War and saved Washington's life, and Booger didn't even place in the first heat of the 2011 Bel Air turtle derby; he was unceremoniously disqualified. Oh yeah, the winning frog in three consecutive hops jumped 148 inches. I know you are a bit disappointed, but so much for inappropriate booger jokes and derogatory ethnic comments regarding installation of light bulbs.

Plodding wins the race. Aesop ca. 550 BC

Acknowledgments

I think it appropriate to acknowledge Alex Heeb for his tireless efforts to educate people, sponsoring organizations, and the academic community about the many negative issues associated with turtle races and exposing the magnitude of the problem. He started this ongoing effort while still a high school student and maintains a web page devoted to this topic (<http://users.ccewb.net/lonerock/turtles/turtleracing.htm>). Sandy Barnett and an anonymous contributor provided some important background information on several of the races discussed. I thank Sandy Barnett also for the photographs she contributed, and Leo Schleicher for layout of the photomontages.

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What You Missed at the September Meeting

John Archer
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Jeff Lemm stood a foot from the base of a 70-foot-high sandstone bluff, two miles or so into a fairly challenging hike, staring straight ahead at a sheer wall covered with a rich green coat of small ferns. All of us appreciated the beauty of the scene and thought that Jeff was merely engrossed in an up-close examination of the plants. Then he said, “Did anyone see this black rat?” and pointed to the barely exposed nose of a small *Pantherophis spiloides* coiled in the greenery at eye level. By the time I got to his location the snake had been a bit more exposed, but when Jeff spied it only a few scales were visible. We all know that luck is a part of field herping, but we also know that one has to be prepared to take advantage of the opportunities presented. Jeff is always prepared. Spotting a few scales in a sea of green is just a small example of his herping skills.

Jeff Lemm was our September speaker. I would write another extensive description of the man, but I’m too lazy for that and I don’t want to add to Jeff’s hat size. His ego is no small thing, though he does have reason for that and he does mostly handle himself with modesty and reticence. OK, that’s a lie. When asked how he saw that little black rat, he replied, “There is no price tag for awesomeness,” or something of the sort. For a complete summary of the man see Bull. Chicago Herp. Soc. 45(5):89-91, 2010, my account of his last speaking engagement. If you don’t wish to look up that article, I’ll just say he’s a herpetologist who serves as Senior Research Coordinator in the Applied Animal Ecology Division at the San Diego Zoo Institute for Conservation Research. For about 20 years, he’s been doing research on the conservation of rock iguanas (*Cyclura* spp.), and having just completed a book about those animals, he was gracious enough to deliver a presentation for us based on



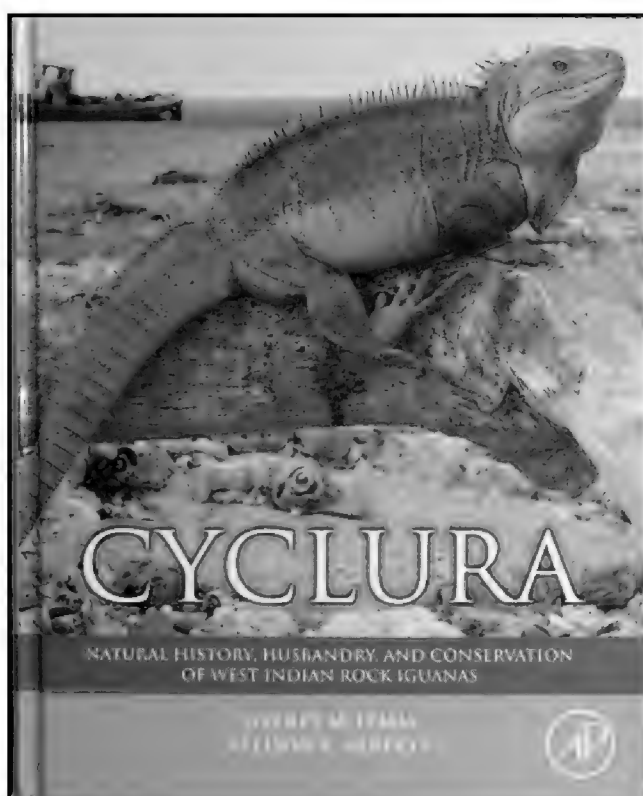
Jeff Lemm. Photograph by Dick Buchholz..

the book. He is also a really fine field herper who founded the North American Field Herping Association that all of you interested in field herping should check into (nafha.org). He’s also funny, a great field companion, and terrific speaker. For more accolades you’re just going to have to read my earlier article.

I’ll tell about the trip that we took with Jeff a little later, but for now, let me write about his presentation titled, “Rock Iguanas: Conservation of the World’s Most Endangered Lizards.” He mentioned that his slides have more text than normal, but they were all illustrated with photos, mostly taken by Jeff. The opening

shot was a majestic Anegada Island iguana (*Cyclura pinguis*) basking on a log with a beached boat in the background, making for an artistic picture that immediately evoked the iguanas’ habitat. Rock iguanas range from the Bahamas to the Lesser Antilles, with the Anegada Island lizard recently revealed as the basal form. Rock iguanas are characterized by specialized eyes that look bloodshot and are presumed to act as sunglasses to protect from the glare of the creatures’ preferred habitat. The toes have cone-shaped scales that allow even a full-grown adult to clamber up steep limestone rock faces. Teeth are tricuspid and capable of delivering a severe bite and the tail is ringed with scales that allow it to act effectively as a weapon. They are large and primarily herbivorous ground-dwelling lizards that encompass 16 taxa. They are considered the most endangered group of lizards in the world.

With slides and pictures Jeff led us through each of the taxa, adding small addendums to the slides and allowing the audience to read much of the text. His conversational style and tremendous knowledge meant that we were continually involved with his presentation. He talked about the Turks and Caicos iguana (*C. carinata carinata*), among the smallest rock iguanas and the Jamaican iguana (*C. collei*), thought to be extinct for 50 years but rediscovered in 1991 and still critically endangered in the wild with less than 150 adults. Perhaps the best known species



Jeff’s book, co-authored with his boss, Allison Alberts, is the best and most up-to-date source of information on these lizards.



Rock iguanas always look regal. An adult female Sister Isles iguana (often incorrectly called the Little Cayman iguana).



A hatchling Anegada Island iguana emerging from the nest.

of *Cyclura*, the rhinoceros iguana (*C. cornuta*), is found throughout the island of Hispaniola and is sometimes sympatric with Ricord's iguana (*C. ricordii*). Photos of one of the largest rock iguanas, the Andros Island iguana (*C. cyclura cyclura*) and one of the smallest, the Exuma Island iguana (*C. cyclura figginsi*) were followed by photos of the Allen Cays iguana (*C. cyclura inornata*) and Grand Cayman blue iguana (*C. lewisi*), the most endangered of the group. The Sister Isles iguanas (*C. nubila caymanensis*) are more often referred to after one of the islands where they're found, Little Cayman. The most stable populations of the group and Jeff's favorite are the Cuban iguanas (*C. nubila nubila*). They're stable because of the tremendous number of small islands just offshore from Cuba that they inhabit. Jeff studied them at Guantanamo Bay. The Anegada Island iguana has velvet-like skin. A stunning head shot of a gold and blue White Cay iguana (*C. rileyi cristata*) resided with an equally stunning head shot of a red and blue Acklin's iguana (*C. rileyi nuchalis*) and was followed by another pretty shot of a gold and blue San Salvador iguana (*C. rileyi rileyi*), demonstrating the variability among these weakly defined subspecies which are small but beautiful. The Navassa Island iguana (*C. cornuta onchiopsis*) was limited to that island and was probably driven to extinction over 50 years ago by feral animals, guano mining, hunting and military operations.

Cyclura live in tropical dry forests, primarily in eroded limestone areas that provide them ample spots of refuge. Jeff says that few researchers survive without a scratch when diving for the lizards in such habitat. The limiting factor to survival is vegetation. As one of the largest seed dispersers, the lizards are important in saving the endangered tropical dry forest habitats. Photos of dry, barren landscapes are shown. Home ranges vary widely between the species, though the polygynous males have larger territories and expand those during breeding season. They feed on a wide variety of plants and take occasional animal protein from road kill to juvenile iguanas. While adults have little to fear from natural predators, excepting the largest Cuban boas (*Epicrates anguifer*), the young are preyed upon by everything from smaller snakes, to ospreys, to barracudas. Of course feral animals take a tremendous toll. A photo of two

males nearly nose-to-nose demonstrates the exacting boundaries that males maintain even though the lines are invisible to human eyes. While very rare, disputes are sometimes settled by combat, which can result in missing limbs, though the losers seem to survive quite well with the amputations. Jeff says some of their research subjects had names such as stumpy and half-leg. A dramatic photo of two males in conflict with the aggressor nearly vertical helped us to realize the occasional viciousness. Oviposition takes place about a month after copulation and the number and size of the eggs varies with the species. All *Cyclura* lay eggs in open soil digging chambers varying from shallow holes a few inches deep to complex tunnels several feet long. The exception is the Andros iguana that Chuck Knapp has documented as depositing eggs in termite mounds. Most females defend the nest, some for a month or more.

A slide appeared with pictures of a skinny dog, a beach full of people and iguanas, a bunch of goats, a cat and a mongoose, a devastated landscape with brush piled into waste mounds, and an iguana skull and bones in the foreground with a makeshift tent in the background. The title is "Threats—all manmade!!!" Between the illegal hunting, introduced species, cars, invasive plants and habitat destruction, it's easy to see why these lizards are in danger of extirpation. In 1991 the International Union for Conservation of Nature/Species Survival Commission (IUCN/SSC) formed the Iguana Specialist Group (ISG) to address the problems facing these animals. Through habitat protection, invasive species control, head-starting, translocation, zoos, research and education and outreach, the ISG has managed to buy all species of *Cyclura* some breathing room while not being able to declare any species saved. One of Jeff's slides showed a Cuban iguana holding the handle of a net draped over an invasive species—Jeff. Jeff stressed that all conservation efforts require the support of the local people. Without local cooperation any conservation attempt is doomed to failure.

We saw slides of the new and world's largest rock iguana breeding facility at the San Diego Zoo Safari Park. Jeff went into some detail about husbandry and stressed that they are not green iguanas and cannot be cared for the same way. They have high metabolisms and consume large amounts of food, need high-temperature basking areas, and require secure hiding spots. The nests need deep soil and it's often difficult to locate the eggs. A slide of eggs in the soil of a flowerpot showed how creative one female was. Jeff said that there was no external



All of the threats to otherwise sustainable populations of rock iguanas are anthropogenic, like these introduced goats.



One of Jeff Lemm's goals in southern Illinois, a timber rattlesnake, was found right off the bat. Photograph by Stephen L Barten.

indication that the eggs were buried in that pot. As with other facts about these iguanas, husbandry details vary among species.

Jeff finished with what he called fun pictures. Photos of him photographing the iguanas. Photos of him carrying the iguanas. Iguanas on idyllic beaches. Iguanas among cactus. Iguanas perched on rocks and hiding in grass. The closing slide was an iguana at sunset. He mentioned that his talk roughly followed the layout of his book but that was no excuse not to buy the book. He filled his talk with interesting anecdotes and clever jokes that I'm incapable of recreating. As usual, you're short-changed by having to read these articles. And remember that if we don't help to save these animals, who will? Participate by going to the International Iguana Foundation website at www.iguanafoundation.org.

Allow me to return to the beginning of this article and Jeff in the field. One of the joys of belonging to your society is the opportunity to hang out with some great people chasing animals in the out of doors. The day after the meeting a group of us headed to the southern part of Illinois. Jeff had planned his talk to coincide with a particularly good time to visit that part of the state. This world traveler had high hopes of finding two venomous snakes he had never seen in the wild, a timber rattlesnake (*Crotalus horridus*) and a copperhead (*Agkistrodon contortrix*). We had a group of first class herpers driving from Chicagoland, including Mike Dloogatch, Steve Barten, Gery Herrmann, Jenny



Really, Steve? There's something in that hole worth photographing? Photograph by John Archer.



Andrew Gilpin demonstrating to Jeff Lemm another method to negotiate some slippery southern Illinois terrain. Photograph by John Archer.

Vollman, and Linda Malawy. CHS presenter Mike Pingleton drove from Champaign, Illinois, Sara and Andrew Gilpin drove from Iowa, and Kyle Salzmann arrived from Wisconsin. We were met in the south by CHS presenter and local resident John Palis. I doubt that a team of field herpers that included Jeff Lemm, Mike Pingleton, and John Palis could be anything less than productive and fun, but all the participants were experienced, congenial, funny, and great company. For two days we roamed the southern part of the state. For two days we found an amazing number of animals while sharing laughs, food, drink and knowledge. We found Jeff's goals (four of each!), as well as green watersnakes (*Nerodia cyclopion*), rough greensnakes (*Opheodrys aestivus*), slimy salamanders (*Plethodon glutinosus*), and green treefrogs (*Hyla cinerea*). We saw lots of cottonmouths (*Agkistrodon piscivorus*) and ribbonsnakes (*Thamnophis proximus*). The species count was over thirty, which is not exceptional for the herp cornucopia that is southern Illinois, but the weather was great, the scenery riveting, most of the food tasty, and the beer cold. We all are frequently questioned about our hobby and why we remain fascinated by these animals. Most people don't understand. We're asked why we hike miles to spy a turtle or flip tons of rocks to find a venomous snake. All of the herpers in the field that weekend know why we do it. Just that trip would answer that question easily. Thanks to all of the participants for an enviable trip. Thanks to Jeff Lemm for another great talk.



Yup, it's a copperhead. Photograph by Stephen L. Barten.

Unofficial Minutes of the CHS Board Meeting, September 14, 2012

The meeting was called to order at 7:42 P.M. at the Schaumburg Public Library. Board members Mike Dloogatch, Jim Foster and Barbara Khan were absent.

Officers' Reports

Recording Secretary: The minutes of the August 17, 2012, board meeting were read and accepted.

Treasurer: The August financial report was presented, discussed and accepted.

Corresponding secretary: Deb reported few phone calls except about red-eared sliders.

Sergeant-at-arms: Attendance at the August general meeting was 59

Committee Reports

Shows:

- Notebaert, first full weekend of each month. Josh Chernoff is coordinator.
- Garfield Park Conservatory (Halloween), October 31, 4 – 8 P.M.
- SEWERFest, November 11.
- Chicagoland Family Pet Expo, Arlington Park Racecourse, March 15–17, 2013.

ReptileFest 2013: April 13-14, 2013. This will be the 20th anniversary. Kim Klisiak is working on new cards. Flyers will be changed so a small number can be printed for NARBC without listing sponsors since they have not been confirmed yet.

Old Business

Junior Herpers club: The Notebaert has agreed to try 6 months of meetings. We need to do background checks on all adult volunteering with the program. This will cost \$150 per person. Aaron moved to allocate \$1500.00 for background checks. Cindy seconded. Discussion: We need to do this to protect the society as well as the kids. The motion passed unanimously. We will provide membership cards for the kids. They will need to present them to enter the Notebaert with no admission charge for the meeting. We will need to monitor the attendees so that there is no wandering the museum before or after the meetings.

National Herpetological Society: The website is almost ready, and the board is in place. They are looking for true facts and info on deaths/injuries from reptiles, as well as positive, pro-herp news stories.

New Business

The Little Red Schoolhouse Nature Center has offered a room for board or other meetings if we need one.

Round Table

Mike Scott is moving to Addison.

Aaron LaForge is the proud father of another baby girl, Phoebe.

Bob Bavirsha will be at Croctoberfest at the Lake Forest Discovery Center, October 20.

The meeting was adjourned at 8:56 P.M.

Respectfully submitted by Jenny Vollman



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For sale: **highest quality frozen rodents**. I have been raising rodents for over 30 years and can supply you with the highest quality mice available in the U.S. These are always exceptionally clean and healthy with no urine odor or mixed in bedding. I feed these to my own reptile collection exclusively and so make sure they are the best available. All rodents are produced from my personal breeding colony and are fed exceptional high protein, low fat rodent diets; no dog food is ever used. Additionally, all mice are flash frozen and are separate in the bag, not frozen together. I also have ultra low shipping prices to most areas of the U.S. and can beat others shipping prices considerably. I specialize in the smaller mice sizes and currently have the following four sizes available: Small pink mice (1 day old—1 gm), \$25/100; Large pink mice (4 to 5 days old—2 to 3 gm), \$27.50/100; Small fuzzy mice (7 to 8 days old—5 to 6 gm), \$30/100; Large fuzzy mice /hoppers (10 to 12 days old—8 to 10 gm), \$35/100 Contact Kelly Haller at 785-234-3358 or by e-mail at kelhal56@hotmail.com

For sale: High quality, all locally captive-hatched tortoises, all bred and hatched here in the upper midwest. Baby leopards, Sri Lankan stars, and pancakes usually available, and are all well-started and feeding great! Leopards are \$125 ea., Sri Lankans (2012 hatched) \$475 ea. And Pancakes are \$195 ea. Leopards for out of state sale/shipping require a veterinary health certificate (inquire for cost). E-mail at KKranz1@wi.rr.com or call Jim or Kirsten at 262 654 6303.

Free to a good home: Over 30 years of the *Bulletin of the Chicago Herpetological Society* (1982-2012; 1–2 issues may be missing). Boxed and ready for pickup in Oak Park, Illinois. Email: robstreit@aol.com or call Rob Streit at 708-383-6830.

Herp tours: **Costa Rica herping adventures**. Join a small group of fellow herpers for 7 herp-filled days. We find all types of herps, mammals, birds, and insects, but our target is snakes. We average 52 per trip, and this is our 10th year doing it. If you would like to enjoy finding herps in the wild and sleep in a bed at night with air-conditioning, hot water and only unpack your suitcase once, instead of daily, then this is the place to do it. Go to our web-site <http://hiss-n-things.com> and read the highlights of our trips. Read the statistics of each trip and visit the link showing photos of the 40 different species we have found along the way. E-mail at jim.kavney@gmail.com or call Jim Kavney, 305-664-2881.

Turtle Owners: Moving into the southwestern suburbs of Chicagoland? Home For Sale, with fully equipped Turtle Ponds, indoor and outdoor. Housed in glass solarium which is heated, cooled, and humidity controlled, with plumbing for hot water. MLS Listing #: 08025672. To schedule “viewing” call Janet Connelly, Realtor, at (708) 431-4718. (Classic Realty Group).

Line ads in this publication are run free for CHS members — \$2 per line for nonmembers. Any ad may be refused at the discretion of the Editor. Submit ads to mdloogatch@chicagoherp.org.



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News and Announcements

2013 CHS HERPETOLOGICAL GRANTS PROGRAM

The mission of the Chicago Herpetological Society is education, conservation and the advancement of herpetology. To further this mission, the CHS provides grants of up to \$1,000 in the following categories:

1. Illinois Herpetology
2. Graduate Student Research in Herpetology
3. Undergraduate Research in Herpetology
4. Conservation
5. Captive Management, Husbandry and Propagation

The number of grants awarded in each category will depend on the grant applications received; it is possible that not all categories will receive awards and some categories may receive more than one award. The Grants Committee reserves the right to reassign the category under which a given proposal is submitted.

To qualify for a grant, the applicant must be a member of the Chicago Herpetological Society as of December 31, 2012. In accepting a grant, the recipient agrees to acknowledge the Chicago Herpetological Society in any publications or public presentations of research funded by this grant. Further, the recipient agrees to abide by all state and federal laws.

Recipients must submit a short report of their research findings to the CHS within 6 months of their anticipated completion date. The report should be written for a general audience and be suitable for publication in the CHS *Bulletin* or on the CHS webpage. This requirement may be waived if results will be published in a peer-reviewed journal within a year. Recipients may be invited to present a program at a CHS general meeting.

Applications must include the following:

1. Project title
2. Applicant's name, address, phone and email
3. Submission category
4. Introduction—Provide background for the proposed work. Include a clear statement of the objectives of the proposed work.
5. Materials and methods—Describe the study site and the materials and methods (in non-technical terms) that will be used to accomplish the objectives of the proposed research. Attach plans, diagrams and maps as necessary. Indicate whether you have an approved Animal Care (IACUC) protocol covering the proposed methods or whether you will be submitting such a protocol.
6. Applicability and broader implications—How does this work apply to conservation, education and the advancement of herpetology?
7. Budget—Indicate the budget for the entire project and make clear what portion the CHS grant money would fund.
8. Anticipated completion date for the research
9. Applicant curriculum vitae
10. Letters of support—Student applicants must include a letter of support from a faculty advisor. For non-academic individual and institutional applicants, letters of support from collaborating partners or institutions are strongly encouraged. Letter(s) of support may be emailed and should include an address and phone number at which the writer can be contacted. Letter(s) of support may also be sent by postal mail.

Proposals should be submitted as email attachments. Attachments should include the applicant's name in the file name. Proposal text should not exceed five double-spaced pages (excluding literature cited, applicant's CV, and letters of support) and should be typed using a common font (e.g., Arial, Times, Courier) no smaller than 10pt. Applications must be received by December 31, 2012, and awards will be announced by February 15, 2013.

Proposals should be emailed to grants@chicagoherp.org

Questions should be directed to Mike Dloogatch (773) 588-0728, or grants@chicagoherp.org

UPCOMING MEETINGS

The next meeting of the Chicago Herpetological Society will be held at 7:30 P.M., Wednesday, October 31, at the Peggy Notebaert Nature Museum, Cannon Drive and Fullerton Parkway, in Chicago. **Gerold Merker**, a private breeder from northern California, will speak to us about rosy boas. Gerold is a co-author of *Rosy Boas: Patterns in Time* and several other books on snakes of the western U.S..

The November 28 meeting will include the annual election of officers and members-at-large of the CHS Board of Directors. Also at this meeting local CHS member **Julie tenBensel** will present “Today’s Dragons: Captive Keeping of Both Arboreal and Terrestrial Monitors.”

The regular monthly meetings of the Chicago Herpetological Society take place at Chicago’s newest museum—the **Peggy Notebaert Nature Museum**. This beautiful building is at Fullerton Parkway and Cannon Drive, directly across Fullerton from the Lincoln Park Zoo. Meetings are held the last Wednesday of each month, from 7:30 P.M. through 9:30 P.M. Parking is free on Cannon Drive. A plethora of CTA buses stop nearby.

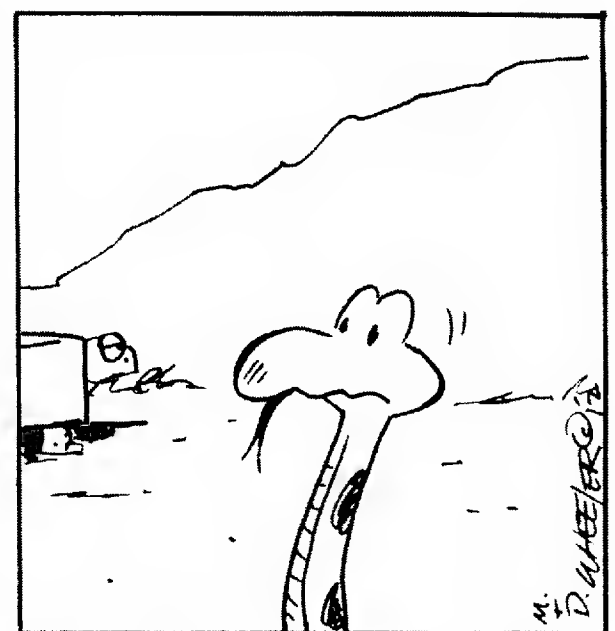
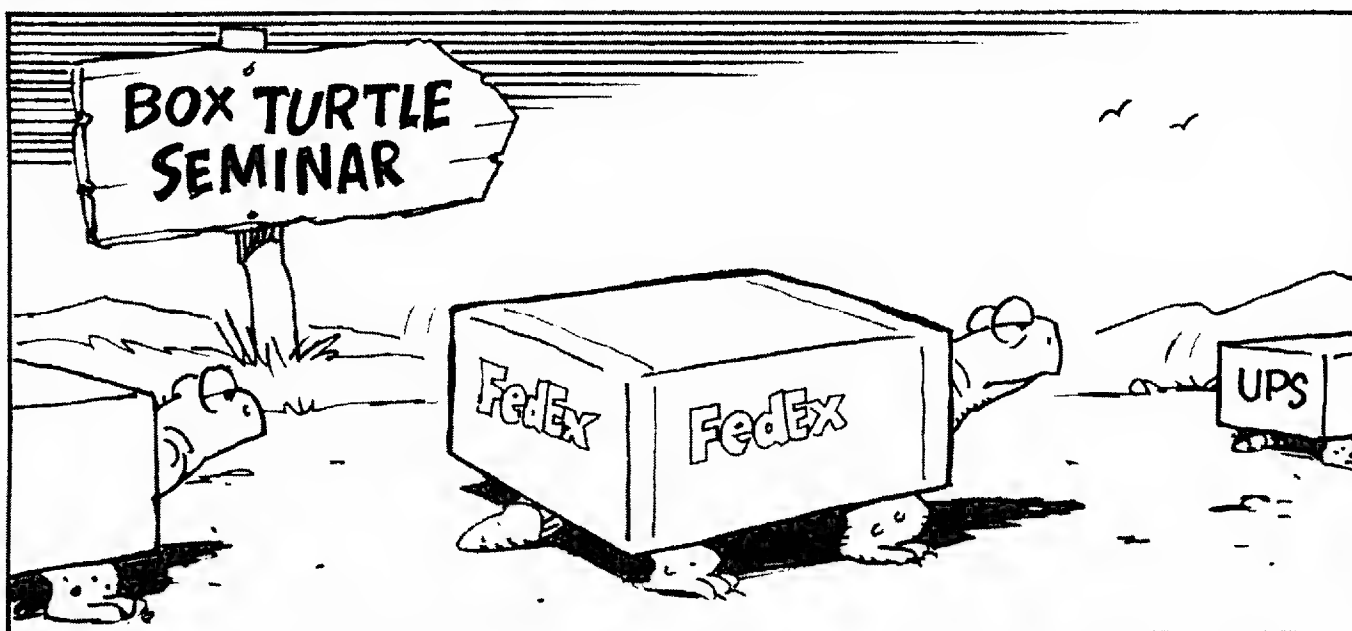
Board of Directors Meeting

Are you interested in how the decisions are made that determine how the Chicago Herpetological Society runs? And would you like to have input into those decisions? If so, mark your calendar for the next board meeting, to be held at 7:30 P.M., October 19, in the adult meeting room on the second floor of the Schaumburg Township District Library, 130 S. Roselle Road, Schaumburg.

The Chicago Turtle Club

The monthly meetings of the Chicago Turtle Club are informal; questions, children and animals are welcome. Meetings normally take place at the North Park Village Nature Center, 5801 N. Pulaski, in Chicago. Parking is free. For more info visit the group’s Facebook page.

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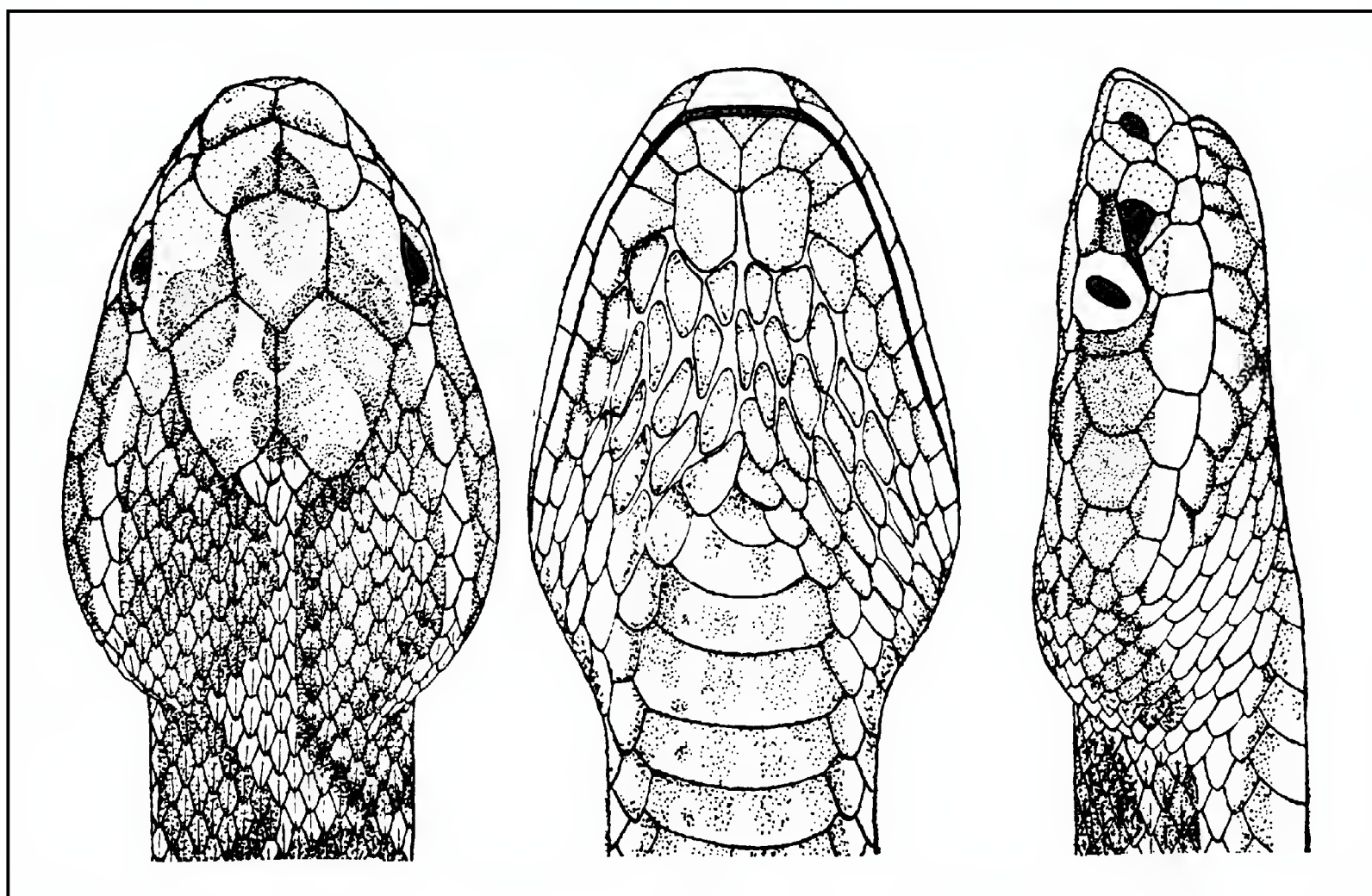
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Volume 47, Number 11
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BULLETIN OF THE CHICAGO HERPETOLOGICAL SOCIETY

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Two-headed Snakes Make High Maintenance Pets	Van Wallach	137
The Hole in the Wall Gang	Stephen R. Johnson and Mary Stark	140
Notes on the Herpetofauna of Western Mexico 7: Reproduction of <i>Plestiodon callicephalus</i> in Jalisco, Mexico	Ángeles Penilla-Juárez, Daniel Cruz-Sáenz and David Lazcano	141
Herpetology 2012		144
Unofficial Minutes of the CHS Board Meeting, September 14, 2012		147
Advertisements		148

Cover: Mamushi, *Gloydius blomhoffii*. Drawing (as *Agkistrodon halys blomhoffii*) from *A Monograph of the Snakes of Japan* by Moichiro Maki, 1931.

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The Chicago Herpetological Society is a nonprofit organization incorporated under the laws of the state of Illinois. Its purposes are education, conservation and the advancement of herpetology. Meetings are announced in this publication, and are normally held at 7:30 P.M., the last Wednesday of each month.

Membership in the CHS includes a subscription to the monthly *Bulletin*. Annual dues are: Individual Membership, \$25.00; Family Membership, \$28.00; Sustaining Membership, \$50.00; Contributing Membership, \$100.00; Institutional Membership, \$38.00. Remittance must be made in U.S. funds. Subscribers outside the U.S. must add \$12.00 for postage. Send membership dues or address changes to: Chicago Herpetological Society, Membership Secretary, 2430 N. Cannon Drive, Chicago, IL 60614.

Manuscripts published in the *Bulletin of the Chicago Herpetological Society* are not peer reviewed. Manuscripts should be submitted, if possible, by email or on IBM PC-compatible or Macintosh format diskettes. Alternatively, double-spaced, type-written manuscripts may be submitted in duplicate. Manuscripts and letters concerning editorial business should be sent to: Chicago Herpetological Society, Publications Secretary, 2430 N. Cannon Drive, Chicago, IL 60614. **Back issues** are limited but are available from the Publications Secretary for \$2.50 per issue postpaid. **Visit the CHS home page at** <<http://www.Chicagoherp.org>>.

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Two-headed Snakes Make High Maintenance Pets

Van Wallach
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Introduction

Two-headed, or dicephalic, snakes are marvelous freaks of nature. The general term encompasses a variety of conditions from two-nosed and two-tailed snakes, two-headed and two-bodied snakes, and even conjoined twins. There is only one book on the subject, now 75 years old, detailing 225 cases of 44 species in 29 genera (Cunningham, 1937). A review five years ago summarized our knowledge of dicephalic snakes as follows: a total of 950 cases including 169 species from 93 genera (Wallach, 2007). Currently there are 1350 cases known with 191 species in 103 genera.

Unfortunately, most of them drown in the egg, are stillborn, or die shortly after birth. The ratio of dicephalic monsters to normal individuals in wild populations of snakes has been estimated in various publications as between 1 in 20,000 and 1 in 100,000 births ($\bar{x} = 1$ in 67,500, $n = 4$). However, based on a survey of breeders, the frequency of captive-born dicephalics is significantly greater, between 1 in 120 and 1 in 10,000 ($\bar{x} = 1$ in 2,667, $n = 17$). This implies that captive-bred dicephalics are 25–100 times more frequent than wild born monsters. Among the dozen possible causes of axial bifurcation, the two that most likely are responsible for the increased frequency of two-headed snake births are inbreeding depression (including back-crosses, hybridization, albinos, siblings, designer morphs, etc.) and temperature fluctuation during incubation (either high or low).

Husbandry

A major cause of death in two-headed snakes is their inability to normally pip the egg and crawl out on their own. Thus, many specimens that could survive end up drowning in the egg, unbeknownst to the breeder. Most of the “did not hatch” specimens were untouched by the breeder until a day or two after the last normal neonate was born. If they had been noticed earlier and given assistance in getting out of the egg they probably would have survived. It is therefore important to keep an eye on any egg that does not pip with the others and open it to allow a suspected dicephalic to emerge. Sometimes one head will pip the shell but the other one cannot.

After a dicephalic has been born alive (and hopefully in good health), it faces numerous problems in comparison with its normal siblings. Feeding on its own is impossible. Two-headed snakes have heads that are smaller than those of equal sized individuals; my snake’s heads were 20% smaller than normal *Lampropeltis triangulum* of equal size. So feeding the neonates is especially difficult. Not only do you have to provide food that is acceptable, it also has to be smaller than normal. My snake, although native born in Maine where lizards do not exist, completely refused all manner of invertebrates and pinkie mice. It finally was enticed to eat a skink from Louisiana and the scent was applied to the pinks in succeeding weeks until it was weaned off lizards and started taking mice on its own.

Locomotion is normally very difficult with two brains com-

peting for the control of one body. This results in the typical wavering or vibrating motion that reflects the struggle of each head to go in a different direction. Given time, one head will normally become dominant and take over the business of crawling, at which time it will become smoother. Any undue excitement will usually elicit the quivering behavior once again.

Shedding presents additional problems as the skin will not come off any further than the bifurcation of the necks. The skin must be cut between the necks to allow the snake to crawl completely out. As the snake gets older and stronger it can tear the skin at the neck juncture and may still shed properly.

My snake disliked any type of water. Although it would drink out of its water dish, it never voluntarily soaked (even before shedding) and whenever it was placed in a larger container with water, it swam frantically towards the bottom of the dish. It never would find its way back to the surface but would continue to swim around the bottom of the container. This must have had something to do with its double nervous system.

Care must be taken with the objects placed in the dicephalic’s cage. Whereas most snakes need a box to hide in or some covering shelter like bark or wood, such items can be disastrous (and lethal) to a two-headed snake. When one head goes on one side, and the other head on the other side, with something in between, danger lurks! The snake is not smart enough to decide to back up and go a different way. Instead, both heads will continue to press forward and, at the least, cause damage by abrading the scales in the fork of the neck.

“Brady & Belichick”

I was given a wild-caught, newborn eastern milksnake (*Lampropeltis t. triangulum*) from Winthrop, Maine (44°20'08"N, 69°59'06"W), on 27 October 2004 (Wallach, 2005). The hatchling, collected 26 September by Glen Tricarico in a rock wall in his back yard, was a 200 mm long female that weighed 4.0 g. Its



Discovered in a rock wall—first photo—taken before capture.
Photograph by Glen Tricarico.



Caged hatchling prior to its first shed. Photograph by Glen Tricarico.

first shed occurred on 7 October, indicating that it was collected shortly after birth as newborn snakes generally shed within the first 7–10 days. This snake refused all offered food items (crickets, earthworms, slugs, mealworms, and mouse tails and feet) for more than five weeks until I obtained some juvenile little brown skinks (*Scincella lateralis*) from Louisiana. Upon placing a live skink in the container with the snake, the snake started twitching and thrashing around and the left head grabbed the skink whereupon the right head (which turns out was the dominant one) attacked its left counterpart! While the left was trying to swallow the wriggling lizard, the right was chewing on the left head. After separating the heads I broke the lizard in half and gave part to the right head so that both heads had something to swallow. After that it was just a matter of rubbing skink scent on the smallest pinkie mice (1 g) I could find to entice the snake to feed. On 18 November it took its first non-scented mouse and feed on mice the rest of its life without any problem except for size.

It lived for exactly 6.5 years until I accidentally overheated it while soaking it before shedding. During that time it grew to 815 mm and weighed 160 g (averaging 95 mm/yr and 23.7 g/yr). It shed 51 times (mean shed interval 43 days with an average of 8 sheds/year). It ate 663 meals with the right head eating 490 times (78.6%) and the left head 173 times (21.5%). Total weight of all mice consumed was 1413 g (1110 g by right head, 300 g by left). Because each head was 20% smaller than the head of a similar-sized milksnake, the largest mice it ever ate weighed 7 g. It preferred pinkies weighing 2–4 g.



Right head (Belichick) chomping on left head (Brady). Photograph by Van Wallach.



Each to its own. Photograph by Van Wallach.

One time the right head grabbed a fuzzy in the middle and worked around to the rear of the mouse. After struggling unsuccessfully for an hour to swallow it backwards I pulled the mouse out and turned it around and the snake promptly ate it. It also helped on many occasions to cut the appendages off the pinkies before feeding them to the snake. Sometimes both heads would end up swallowing the same mouse, one from each end, and then I would have to separate them.

Each head was offered mice at every feeding: sometimes both heads would feed simultaneously, less often only the left head would eat, and most frequently just the right head would feed. But there were no patterns. During its first year, the right head ate 35 times, the left head only 10 (ratio of right/left = 3.5) but in year two (from 23 Oct. 2005 to 23 July 2006) the right head ate 15 times, the left head 30 times (ratio = 0.5) or 23 October 2005 to 17 March 2006 the left head ate 17 times, the right head only 3 times (ratio = 0.18). All other years the right head ate 2.5–7.5 times as many meals as the left.

It was discovered early by a barium X-ray on that the snake had two separate stomachs, the right stomach twice the diameter of the left, the digestive tracts joining at the pyloric junction.



Right head stealing a pink that the left head had started swallowing. Photograph by Van Wallach.



Belichick and Brady at 2 years of age. Photograph by Van Wallach.

Therefore it was safe to allow both heads to swallow mice simultaneously. During the first year, the snake was so small it took 15–45 minutes to swallow even the tiniest pinkie. A 1 g mouse represented 25% of the snake's body weight.

The snake learned several things during its lifetime (Wallach, 2006). A couple involved feeding behavior. During the first two years, whenever both heads were feeding and one head would finish a food item, it would then attack the other head and start chewing on it (whereupon they had to be carefully separated). Placing a card between the heads prevented one head from attacking the other. And after a few years, neither head would attack the feeding head.

When only one head was feeding, the opposite head would not hold still and let the feeding head swallow its mouse. The non-feeding head would crawl around the cage apparently oblivious to the action of the feeding head and this often prevented the other head from successfully swallowing its meal with the mouse being dragged loose from the snake before it got most of it down its throat. After about a year the left head learned to cooperate when the right head was feeding and remain passive until the right head was finished; however, the right head never learned to do that and it continually crawled around while the left head was attempting to swallow a mouse.

When swallowing a mouse the snake never used an S-shaped kink in its neck to force the food into the stomach. Instead, it would just compress the neck anterior to the food and force it posteriorly.

One time the right head ate a mouse, a second mouse was offered but refused, and it was then given to the left head, which started eating it. The snake was crawling around so vigorously that it eventually knocked the mouse out of the left head. The left head again found the mouse and had it three-quarters swallowed when the right head started thrashing around (like a snake



Belichick and Brady after death. Photograph by Van Wallach.

does when it wants to regurgitate a meal) as if it didn't want the left head to eat. As the left head was nearly finished swallowing its mouse, the right head opened its mouth wide four times and kinked its neck as if to regurgitate the mouse! Once the left head's mouse reached the throat the regurgitation reflex of the right head stopped. Then each head fought to be in a superior position as in male combat. This happened about a half dozen times.

On two occasions in 2005, when taken outdoors, the snake crawled backwards as easily as forwards, with the tail smoothly leading the way! The first time this happened there were two witnesses, the second time there were four. However, I was unable to capture this movement on video so it is undocumented. As the snake grew larger it never crawled backwards again.

In 2006 it escaped and was missing for six weeks but one night I found it on the floor, dehydrated and thirsty. It drank water for five minutes straight. It lost 19 g of body weight (6.4%) during the 7-week fast. In addition to its 6-week forced fast of 27 September–13 November 2006 when it escaped, the snake voluntarily fasted several times and neither head would eat: 5 weeks from 5 April–22 May 2007, 5 weeks in 13 June–23 July 2009, 8 weeks from 23 July–24 September 2009, and 8 weeks from 6 November–24 December 2010. One other escape occurred. After a feeding on 4 May 2009 the cage lid was not securely snapped down and the snake got out and crawled into a heating duct vent and curled up. It was found the next morning after a short search.

The study of the anatomy and behavior of dicephalic snakes fascinates and intrigues me and I would like to hear from anyone who has unpublished information about any specimen. A monograph documenting all known cases is currently in progress.

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The Hole in the Wall Gang

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While making a short visit to Saint Feriole Island on the Wisconsin side of the Mississippi river we were fortunate enough to observe a small contingent of what must be a larger local population of northern water snakes (*Nerodia sipedon sipedon*). The first snake we encountered was much like other northern water snakes seen elsewhere in Iowa and like those that I (SJ) have seen in eastern Virginia; dull in coloration, having grayish-tan ground color with dark gray bands, as depicted by Johnson (2000) and by Oldfield and Moriarty (1994). It was basking on a sidewalk bordering the St. Feriole public garden and blocked from the river by a white painted stone and mortar wall and a 30 foot drop. On seeing us the snake did not resort to pugnacious display as described by Oldfield and Moriarty but instead tested the air with its tongue and painstakingly retreated into a hole in that wall. By the time it ceased moving, apparently behaving as if we were no longer witness to it, about 3 inches of tail still protruded. This behavior seems very much akin to overwintering behavior described by Breckinridge (1944). This site did not however seem an adequate equivalent of a rock crevice but might suffice for a smaller individual. Furthermore, the hole did not face the river and it was equidistant from either end of the wall making the trek for an overwintering snake a minimum distance of 25 lateral feet in addition to the 20 to 30 foot drop to the river.

About half an hour later, while inside a small museum and overlooking the river from a large deck we saw another and much more brightly colored water snake. My (SJ) first reaction was that we were seeing a northern copperhead instead of the copperhead's congener the water moccasin that people apparently confuse with the northern water snake (Oldfield and Moriarty, 1994). This particular northern water snake had a basal coloration of lighter yellow with distinctly reddish brown bars. We watched the snake for several minutes as it progressed northward along the pebble strewn shoreline and as its head and fore section dove to apparently forage by a boulder. The snake looked much more like the midland water snake (*Nerodia sipedon pleuralis*) described by Johnson (2000). The extreme differences in the body coloration between these two individuals clearly match the description of variability within the species as described by Tennant and Bartlett (2000), who state that "perhaps the most outstanding attribute of the northern water snake is the variability of its appearance."

Since the time of our observations in early June 2012 the severe drought increased over the summer and even dried portions of the Mississippi. Our observations occurred when the drought was only beginning. We can only hope that conditions at St. Feriole haven't deteriorated to the point where the water snakes are impacted. We will return to St. Feriole next spring to explore the fate of these snakes of the hole in the wall gang.

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Notes on the Herpetofauna of Western Mexico 7:
Reproduction of *Plestiodon callicephalus* in Jalisco, Mexico

Ángeles Penilla-Juárez¹, Daniel Cruz-Sáenz^{2,3} and David Lazcano³ (imantodes52@hotmail.com)

Abstract

We collected a pregnant female mountain skink (*Plestiodon callicephalus*) and the eggs from two nests of this species from the vicinity of Huaxtla, Zapopan, Jalisco. The female was kept in captivity until oviposition. All eggs were kept until hatching. We report on behavior we observed that we characterize as parental care. We provide information on clutch size, egg size and hatchling size in this species.

Resumen

Fue colectada una hembra y dos nidos de *Plestiodoncallicephalus* en la localidad de Huaxtla, Zapopan, Jalisco. Estas fueron mantenidas en cautiverio hasta que se llevo a cabo la puesta del nido y posteriormente la eclosión de las crías. Se observaron algunas conductas de cuidado parental y fueron caracterizados los huevos y el tamaño de las crías. Con este trabajo pretendemos aportar información sobre la caracterización de los tamaños de los huevos y crías de esta especie.

Introduction

Campbell and Simmons (1961) collected a female mountain skink (*Plestiodon callicephalus*) and its nest of three eggs from a locality near Guadalajara (Table 1). All three eggs hatched but one of the babies could not be found and was presumed to have been eaten by the mother. Campbell and Simmons reported measurements for the remaining two hatchlings (Table 2).

Zweifel (1962) reported on a female *Plestiodon callicephalus* that had been collected in the state of Nayarit and subsequently laid six eggs. Zweifel included measurements for three of the eggs (Table 1). Zweifel assumed oophagy because of the disappearance of one of three eggs that had been left in the cage with the mother and another skink. Oophagy has also been documented for brooding prairie skinks (*Plestiodon septentrionalis*) ingesting the nonviable eggs (Somma, 1989).

Mountain skinks are known to move eggs in the nest, presumably to protect them from predators or to provide a more

Table 2. Measurements of hatchling *P. callicephalus* by Campbell and Simmons (1961)

Hatchling	Snout–vent length (mm)	Tail length (mm)
1	23	31
2	24	32

suitable temperature (Cruz-Sáenz et al., 2011). And prairie skinks may move their eggs when stressed in captivity (Somma, 1985).

Study site

Huaxtla is in northern Jalisco, UTM 664429 2315806, 1458 m above sea level. It is within the municipality of Zapopan and is 20 km northwest of the metropolitan area of Guadalajara. This site is accessed by the Federal Highway # 123 to Colotlán. Mountains here form part of Sierra de San Esteban; dominant vegetation is oak forest, with some patches of tropical deciduous forest on a few slopes and in ravines.

Material and methods

A female mountain skink was captured in the locality of Huaxtla. Lizards were collected between 22 June and 15 July 2012. Two nests were collected too. The female and the eggs collected in field were measured and weighed, as were the resulting hatchlings.

Results

The pregnant female laid the eggs over a period of four days: three eggs were laid on the first day, and one egg was laid on each of the second, third and fourth days, for a total of six eggs. After 26 days of incubation, we observed that the female had

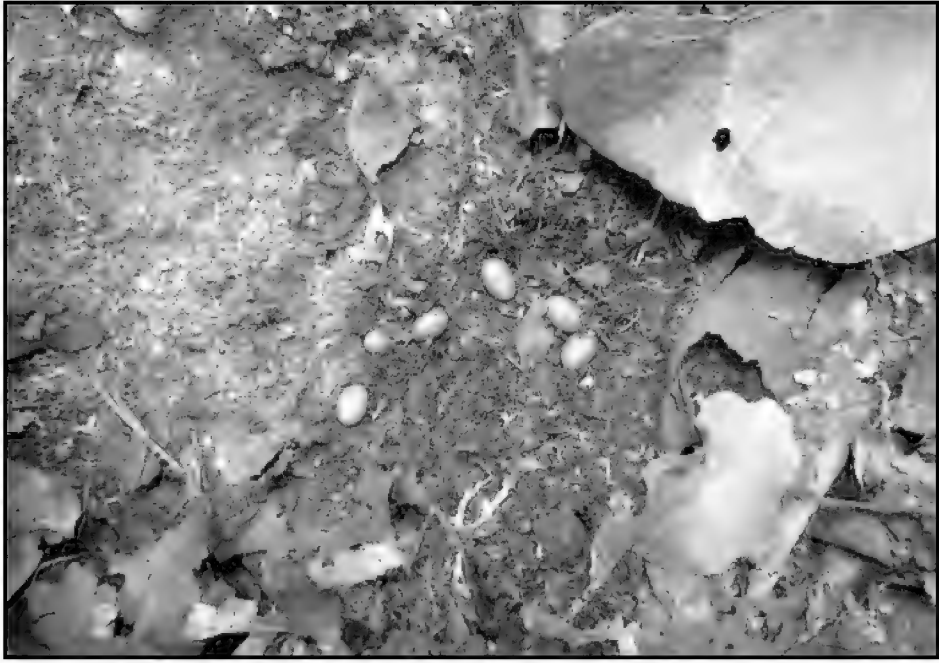
Table 1. *Plestiodon callicephalus* egg measurements reported by Campbell and Simmons (1961) and Zweifel (1962).

Source	Egg	Length (mm)	Width (mm)
Campbell and Simmons (1961)	1	7	6
	2	7	6
	3	7	5
Zweifel (1962)	1	15.3	10.7
	2	12.7	8.0
	3	10.9	7.2

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Female *Plestiodon callicephalus* in the nest with her eggs.



Another nest of *Plestiodon callicephalus* with eggs.



Weighing an egg.



Measuring an egg.



A *Plestiodon callicephalus* hatchling emerging from the egg.



Four hatchling *Plestiodon callicephalus*.

(All photographs by Daniel Cruz-Sáenz)

Table 3. Egg measurements from three nests of *Plestiodon callicephalus*.

Egg	Length (mm)	Width (mm)	Weight (g)
Nest 1			
1	12.35	7.97	0.42
2	12.43	7.80	0.42
3	11.67	8.00	0.40
4	11.44	7.43	0.34
5	11.44	5.82	0.22
6	10.80	6.02	0.23
Nest 2			
1	14.52	8.70	0.81
2	12.47	8.57	0.98
3	13.83	9.23	0.79
4	14.07	9.09	0.76
5	13.72	9.30	0.84
6	13.32	9.44	0.82
Nest 3			
1	18.97	11.48	1.55
2	17.88	10.74	1.50
3	18.42	11.11	1.52

eaten five eggs. Possibly these were infertile or rotten. After a month the last egg was opened: the embryo was alive but in an earlier stage of development than expected. We observed parental care behavior on some occasions when the female moved the eggs, probably for thermoregulation. The female laid six eggs; the second nest contained six eggs; the third nest contained six eggs, only three of which hatched.

Conclusions

Our observations of clutch size differ from Campbell and Simmons (1961): they report only three eggs. And also they report an average egg size of 7 × 6 mm, while we found a variety of sizes from 10.8 × 6 mm to 18 × 11 mm. Zweifel (1962) reported six eggs but he only described one nest. We found two nests with six eggs each, and the pregnant female also laid six eggs. Based on these observations, we assume that a clutch size of six eggs is normal for *Plestiodon callicephalus*. The biggest egg reported by Zweifel (1962) was 15.3 × 10.7 mm. We registered an egg of 18.47 × 11.48 mm. We registered the biggest hatchling: 26.78 mm SVL and 0.42 g in weight. Our study confirms parental care and oophagy for *P. callicephalus*.

Acknowledgments

We thank Alejandra Cueto-Mares, Francisco Muñoz Nolasco and Miguel Angel López Cuellar for their support with the fieldwork.

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Table 4. Measurements of hatchling *Plestiodon callicephalus* from three nests. SVL = snout–vent length; TL = tail length; HW = head width; HL = head length; HH = head height; FL = femur length; W = weight.

Hatchlings	SVL (mm)	TL (mm)	HW (mm)	HL (mm)	HH (mm)	FL (mm)	W (g)
Nest 1							
1*	22.04	24.82	3.88	5.32	3.18	2.25	0.25
Nest 2							
1	23.66	31.00	4.02	6.71	3.04	3.52	0.31
2	22.96	30.01	3.53	5.89	3.00	3.27	0.27
3	23.60	32.38	3.83	6.32	2.93	3.16	0.28
4	24.63	32.30	3.81	6.02	3.10	3.72	0.32
Nest 3							
1	24.81	33.70	4.08	6.52	3.35	2.90	0.40
2	25.15	35.44	3.72	6.11	3.27	3.28	0.37
3	26.78	36.07	4.28	6.27	3.27	3.39	0.42

* Measurements of live hatchling that was taken from the egg prematurely.

Herpetology 2012

In this column the editorial staff presents short abstracts of herpetological articles we have found of interest. This is not an attempt to summarize all of the research papers being published; it is an attempt to increase the reader's awareness of what herpetologists have been doing and publishing. The editor assumes full responsibility for any errors or misleading statements.

HOG-NOSED SNAKE NEST SITE SELECTION

C.A. Peet-Paré and G. Blouin-Demers [2012, Canadian J. Zoology 90(10):1215-1220] note that nest-site selection is an important behavior in oviparous reptiles because incubation conditions affect offspring phenotype, with favorable conditions leading to higher offspring fitness. They sought to identify the habitat characteristics involved in nest-site selection in eastern hog-nosed snakes (*Heterodon platirhinos*) and to determine whether females select nest sites that result in offspring with phenotypes likely to improve fitness. They compared the habitat characteristics and temperature profiles of 21 nests with 21 randomly selected sites. Eastern hog-nosed snakes selected open, grassy sites with fewer herbs and shrubs than random sites, and nests were significantly warmer than random sites during the 2 years of the study. In the second year of the study, they incubated 215 eggs from eight nests in a split-clutch design at mean nest (24°C) and random site (22°C) temperatures approximating those of the first year of the study. Eggs incubated at 24°C resulted in neonates that hatched earlier, had fewer scale anomalies, were larger, and swam faster than neonates from eggs incubated at 22°C. These results indicate that eastern hog-nosed snakes select nest sites that lead to offspring with phenotypes likely to improve fitness.

URBAN VERSUS BUSH LIZARD POPULATIONS

S. Iglesias et al. [2012, J. Herpetology 46(3):297-303] note that body size and morphology are important traits that can strongly influence the life history of an organism. One important factor affecting these traits is habitat. Urbanization has resulted in the significant modification of many habitats, and thus, it may be a factor affecting the body size and morphology of species living in the urban environment. This study compared body size and morphology in urban and bush populations of the lizard *Lophognathus temporalis* in and around Darwin, Australia. Monthly measurements were made of invertebrate abundance and soil moisture during one year to compare seasonal variation in resource availability between habitats. All matter excreted by *L. temporalis* during their first four days in captivity was collected as an index of food consumption in the field. It was found that male *L. temporalis* were larger than females and that urban *L. temporalis* were larger than bush *L. temporalis*. Males had longer front limbs, hind limbs, and tails than did females; and in urban populations, they also had larger heads. Urban *L. temporalis* had longer front and hind limbs than did bush *L. temporalis*, although head size and tail length were similar for both groups. Resource availability was seasonally more stable in urban habitats than in bush habitats, and urban *L. temporalis* consumed more than bush *L. temporalis* all year round. The authors conclude that differences in resource abundance between habitats may be an important factor contributing to the morphological differences between urban and bush-dwelling *L. temporalis*.

CRAWFISH FROG BREEDING MIGRATIONS

J. L. Heemeyer and M. J. Lannoo [2012, Copeia 2012(3):440-450] note that movements are risky behaviors to animals, and amphibians are no exception, yet most species of amphibians exhibit cyclic annual movements. Crawfish frogs (*Lithobates areolatus*) are a relatively understudied species of North American amphibian considered to be "Near Threatened" globally. To better understand the biology of this species, and in particular to assess the role that movements play in affecting survivorship, the authors radio tracked 48 crawfish frog adults in 2009–2010. The study encompassed a total of 7,898 telemetered-frog days; individual frogs were tracked for up to 606 days. The data demonstrate two behaviors previously undocumented in this species: 1) migration distances that averaged nearly 0.5 km, and for one frog was approximately 1.2 km; and 2) philopatry to upland burrows excavated by crayfish. Together, these findings indicate that crawfish frogs have a remarkable ability to home to distant upland burrow sites. Burrow fidelity in crawfish frogs involves, in part, following similar migration routes to and from breeding wetlands. Burrow fidelity also occurs after ranging movements, and again often involves individual frogs following the same circuit across years. The authors demonstrate that movements are hazardous for crawfish frogs (about 12 times riskier than burrow dwelling), and therefore have survival consequences. The data further suggest that adult crawfish frogs are not typically moving long distances from one upland burrow to another to populate new sites; instead two mechanisms—adults varying breeding wetlands across years and juvenile dispersion—are primarily responsible for the colonization of new habitats.

CHIRICAHUA LEOPARD FROGS FROM DURANGO

J. W. Streicher et al. [2012, J. Herpetology 46(3):387-392] note that the Chiricahua leopard frog (*Lithobates chiricahuensis*) occurs in parts of the southwestern United States and northwestern Mexico. In the United States, it is listed as a federally threatened species. Although extensive research has been conducted on populations in the United States, the status of most Mexican populations is unknown. The authors used mitochondrial and nuclear DNA to identify a population of *L. chiricahuensis* from the Mexican state of Durango. To better characterize this poorly known population, they examined morphological variation in 30 individuals that included adult males, adult females, and subadult females. Multivariate analyses of 21 size-adjusted body measurements revealed putative shifts in body dimensions associated with gender and ontogeny. Additionally, notable color pattern variation was observed in female specimens. Field observations from 2008 suggest that this population is large and thriving. In light of this, a more comprehensive examination may yield valuable conservation insights and have implications for the management of declining *L. chiricahuensis* populations in the United States.

SCHOOLCHILDREN AND SNAKES

J.-M. Ballouard et al. [2012, J. Herpetology 46(3):423-428] note that the general public prefers to support conservation projects that focus on a few, easily “loveable” species; consequently most of biodiversity is neglected. It is essential to redress such bias and to educate children about the value of a wide diversity of organisms, including those labeled by social bias as less appealing. Because snakes are among the most disliked animals, they are suitable candidates for such endeavor. This study evaluated the impact of a single field trip on the attitudes of more than 500 schoolchildren. The participants were involved in snake catching and were allowed to manipulate nonvenomous snakes. The organizers limited their intervention to providing natural history information and carefully avoided saying that snakes should be protected. Pre- and post-field trip questionnaires were used to gauge the feelings of the children. Although pre-surveys suggested that many schoolchildren like snakes a priori, their attitudes improved following field experience: almost all children declared then that they liked snakes and expressed a strong willingness to protect them. Such change was associated with an increase of the frequency in the responses of the terms linked with affectivity (e.g., “snakes are cute . . .”). Snake handling was the favorite activity, and physical contact with animals appears to be a crucial element to improve schoolchildren’s attitude for an unpopular organism. Results support the promotion of field trips that include physical contact with wildlife over the current trend in the educational systems that promote virtual approaches.

REASSESSMENT OF A TURTLE COMMUNITY

A. L. Pitt and M. A. Nickerson [2012, Copeia 2012(3):367-374] in an effort to identify long-term changes in a river turtle community and its habitat, reexamined the turtle community in a 4.6 km section of the North Fork of White River, Ozark County, Missouri, that was previously studied between 1969 and 1980. They compared data collected in 2004 to data from 1969 and 1980 to determine if alterations in the habitat, community composition, or northern map turtle (*Graptemys geographica*) population size and structure had occurred. Previous studies showed that the population of *G. geographica* declined between 1969 and 1980. The authors’ results indicate that the population of *G. geographica* failed to rebound by 2004. The population of red-eared sliders (*Trachemys scripta elegans*) that established in the research section between 1971 and 1980 expanded their distribution between 1980 and 2004. Threats to the population of *G. geographica* included lack of basking sites, increased human recreational use of the stream, and water quality degradation.

PARENTAL CARE BY FRESHWATER CROCODILES

R. Somaweera and R. Shine [2012, J. Herpetology 46(3):407-411] used remote video cameras to record eight instances of nest excavation and parental transport of offspring to the water by Australian freshwater crocodiles (*Crocodylus johnstoni*) inhabiting Lake Argyle in northwestern Australia. This provides the first in-detail documentation of hatchling transport in this species. Parental assistance during hatching appears to be vital for successful emergence of hatchlings from nests in this area.

DISPERSAL OF NEONATE TIMBER RATTLESNAKES

J. M. Howze et al. [2012, J. Herpetology 46(3):417-422] note that in colder climates, survival of neonate timber rattlesnakes (*Crotalus horridus*) following dispersal relies heavily on conspecific scent trailing and the ability to locate suitable communal hibernacula. Less is known regarding populations in the southern portion of their range where they are more likely to den solitarily in ephemeral overwintering sites. On 6 August 2009, the authors captured a post-parturient female timber rattlesnake with a litter of 23 neonates in a hardwood thicket within a Longleaf Pine (*Pinus palustris*) forest in southwestern Georgia. Fourteen of the neonates were radio-tracked to examine their movements and activity range overlap as they dispersed from the natal site. Snakes were tracked for periods of 1–110 days, daily for the first three weeks and at least three times per week thereafter. Dispersal distances increased over time, and overlap of activity ranges was minimal, potentially reducing intraspecific competition between litter mates. Neonates were located predominantly beneath clumps of vegetation or beside coarse woody debris (62.4%), in hardwood tree branches (31.6%), or just off the ground in vegetation or on top of coarse woody debris (6.0%). Selection of appropriate cover structure may aid in reducing susceptibility to predation.

ACTIVITY OF EASTERN KINGSNAKES

J. M. Howze and L. L. Smith [2012, Copeia 2012(3):460-464] used radio-telemetry to identify diel activity patterns in the eastern kingsnake, *Lampropeltis getula getula* in southwestern Georgia. Tagged snakes were monitored at four time periods within a 24-hour cycle (0800–1359 h, 1400–1959 h, 2000–0159 h, and 0200–0759 h) in spring, summer, and fall (March–November), which comprise the annual activity period for eastern kingsnakes in this region. A logistic regression approach was used to identify specific environmental factors that best predicted eastern kingsnake movement. It was found that eastern kingsnakes were primarily active during the day in the spring and activity was best predicted by air temperature, soil temperature, relative humidity, and light intensity. These observations differed from anecdotal descriptions of nocturnal activity and seasonal shifts in diel activity patterns in eastern kingsnakes.

YELLOW MUD TURTLES ON THE DECLINE

J. L. Christiansen et al. [2012, The Southwestern Naturalist 57(3):304-313] note that studies of the yellow mud turtle, *Kinosternon flavescens*, in the late 1970s and 1980s documented eight clusters of localities in nine counties in Illinois, five in four counties in Iowa, and five in two counties in Missouri. Sampling that began in 1995 verified continued existence of the species at only two localities in Illinois, two in Iowa, and one in Missouri. Severe declines have occurred in the largest population in each of these states. In all three states, lowered water levels, usually due to withdrawal of water from aquifers, have contributed at least partly to some of the declines. Water has disappeared from some ponds for multiple years. Other contributors are encroachment of woody plants on nesting habitats or between nesting areas and aquatic feeding areas, which often are associated with heavy predation on turtles and nests by mesopredators.

WHIP SNAKE DISPERSAL PATTERNS

L. Rugiero et al. [2012, *The Herpetological Journal* 22(4): 259-261] investigated the dispersal of hatchlings from a communal nesting site of the oviparous colubrid snake *Hierophis viridiflavus* using mark-recapture data from a 17-year study. Hatchlings lighter at birth were found to disperse more than heavier ones, but after one year there was no difference in body mass between individuals that rested close to their birth site and those that dispersed further. The authors interpret this result as an adaptive behavior in which heavier newborn snakes are less inclined to disperse from the hatching site, whereas lighter snakes move further away to increase their foraging efficiency.

NUCHAL GLANDS AND ANTIPREDATOR DISPLAYS

H. Takeuchi and A. Mori [2012, *Current Herpetology* 31(1): 47-53] note that several Asian natricine snakes are known to possess special organs called nuchal glands. Extensive studies on the nuchal glands of *Rhabdophis tigrinus* have shown that the glands contain cardiac steroidal toxins known as bufadienolides, which are sequestered from its toad prey and are stored in the nuchal glands as defensive substances. In addition, several species of snakes with nuchal glands exhibit unique behaviors to enhance the effects of the glands (nuchal gland-related behaviors). *Macropisthodon rudis* is the only species that does not have the nuchal glands in the genus. The authors investigated its antipredator displays and chemical preference for toads to gain insight into the evolution of the nuchal glands. The results showed that *M. rudis* does not exhibit the nuchal gland-related behaviors such as neck arching, neck butting, and dorsal-facing posture. Additionally, this species showed high preference for toad chemicals. These results support a previous hypothesis that preference for toads predates the evolution of the nuchal glands and that the unique antipredator behaviors have evolved to enhance the defensive efficiency of the glands.

GENETIC CRISIS OF THE BOLSON TORTOISE

C. A. Ureña-Aranda and A. E. de los Monteros [2012, *Amphibia-Reptilia* 33(1):45-53] note that *Gopherus flavomarginatus* (Testudinidae) is endemic to a series of discontinuous, isolated basins collectively known as the Bolson de Mapimí in the Chihuahuan Desert. Its numbers declined after catastrophic levels of exploitation during the mid-20th century. However currently, the bolson tortoise appears to be on a path to recovery owing to intensive, sustained conservation efforts. The authors sequenced an 842-bp-long fragment of the D-loop from 76 individuals distributed throughout the species' range. The results revealed only two haplotypes. An AMOVA showed that 95% of the variance occurred among populations, whereas the remaining 5% was explained by genetic differences within populations. Tectonic processes together with ecological transformation during the Pleistocene and Holocene may be responsible for the reduction in this species' genetic variation. A bottleneck during which a significant percentage of the haplotype diversity was lost would result in genetic homogeneity. Although there is demographic growth, the lack of genetic diversity is indicative of the potential crisis that the bolson tortoise is facing, and awareness must be brought to this situation.

CUES USED BY WOOD FROGS

V. D. Popescu et al. [2012, *Copeia* 2012(3):424-431] note that juvenile amphibians are capable of long-distance upland movements, yet cues used for orientation during upland movements are poorly understood. Newly metamorphosed wood frogs (*Lithobates sylvaticus*) were used to investigate: (1) the existence of innate (i.e., inherited) directionality, and (2) the use of olfactory cues, specifically forested wetland and natal pond cues during emigration. In a circular arena experiment, animals with assumed innate directionality did not orient in the expected direction (suggested by previous studies) when deprived of visual and olfactory cues. This suggests that juvenile wood frogs most likely rely on proximate cues for orientation. Animals reared in semi-natural conditions (1500-l cattle tanks) showed a strong avoidance of forested wetland cues in two different experimental settings, although they had not been previously exposed to such cues. This finding is contrary to known habitat use by adult wood frogs during summer. Juvenile wood frogs were indifferent to the chemical signature of natal pond (cattle tank) water. These findings suggest that management strategies for forest amphibians should consider key habitat features that potentially influence the orientation of juveniles during emigration movements, as well as adult behavior.

ANTIPREDATOR BEHAVIOR IN WALL LIZARDS

J. Durand et al. [2012, *Amphibia-Reptilia* 33(2):199-206] note that alteration in anti-predatory behavior following geographic isolation has been observed in a number of taxa. Such alteration was attributed to the effect of relaxed selection in the novel environment, reinforced by the cost of anti-predatory behaviors. The authors studied aspects of anti-snake behavior in 987 adult and juvenile wall lizards *Podarcis muralis* from two mainland areas (heavy snake predatory pressure) and two islands (low snake predatory pressure), isolated from the mainland 5000 and 7000 years ago. They conducted a scented retreat site choice experiment using the odors of five different snake species (saurophagous, piscivorous or generalist feeder). Mainland lizards avoided shelters scented by saurophagous snakes, but not those scented by non-saurophagous snake species. Long isolated lizards (7000 years ago) showed no antipredator response to any snake, suggesting a total loss of antipredatory behavior towards saurophagous snakes. More recently isolated lizards (5000 years ago) however showed anti-snake behavior towards a former sympatric adder species, and a tendency to avoid the scent of a sympatric generalist feeder snake. There was no difference in the anti-snake responses between adult and juvenile wall lizards from all four sites, suggesting a limited role for experience (behavioral plasticity) in the expression of anti-snake behavior in wall lizards.

Unofficial Minutes of the CHS Board Meeting, October 19, 2012

The meeting was called to order at 7:51 P.M. at the Schaumburg Public Library. Board members Lawrence Huddleston, Barbara Khan, Deb Krohn, Linda Malawy, Cindy Rampacek and Jenny Vollman were absent. A quorum was not present.

Officers' Reports

Recording Secretary: The minutes of the September 14, 2012, board meeting were read and accepted.

Treasurer: The September financial report was presented, discussed and accepted.

Membership Secretary: Membership numbers are holding steady around 500. A list of newly expired memberships was read.

Publications Secretary: The announcement of the 2013 CHS Grants program is up on our website.

Sergeant-at-arms: Attendance at the September general meeting was 39

Committee Reports

Shows:

- Notebaert, first full weekend of each month. Josh Chernoff is coordinator.
- Chicagoland Family Pet Expo, Arlington Park Racecourse, March 15–17, 2013.

Old Business

Junior Herpers club: Background checks will be done on those CHS adult members who have volunteered to help with this.

Banners: Jason is going to get another banner made, which will incorporate some suggested improvements.

Herps of Illinois: Jason likes <http://herpssofaransas.com> and would like to model our Herps of Illinois web page after it.

New Business

CHS Email: Was broken and is now fixed. Large quantities of undeleted spam in the mailboxes of various board members have been bogging down the system and causing problems.

Show Guidelines: We need to specify the purpose, goals, and expectations of the society to our volunteers representing the CHS at shows.

Round Table

Jessica Tschampa is going to Connecticut for an art show and is bringing ReptileFest cards.

Aaron LaForge had a swell time at the NARBC auction.

Nancy Kloskowski found a box turtle labeled as a Russian tortoise at a pet shop.

Mike mentioned a recent study that showed Chinese soft-shelled turtles excrete more urea through cells in their mouths than through their cloaca.

Dick brought snakes to a fashion show at the Notebaert and they were well received.

Jason has baby tree boas again this year.

The meeting was adjourned at 9:07 P.M.

Respectfully submitted for the recording secretary by Aaron LaForge



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UPCOMING MEETINGS

The next meeting of the Chicago Herpetological Society will be held at 7:30 P.M., Wednesday, November 28, at the Peggy Notebaert Nature Museum, Cannon Drive and Fullerton Parkway, in Chicago. This meeting will include the annual election of officers and members-at-large of the CHS Board of Directors. Also at this meeting local CHS member **Julie tenBensel** will present “Dragons in Our Midst,” a program dealing with the proper husbandry of monitor lizards.

The December 26 meeting meeting will be a holiday party. The CHS will provide soft drinks and snacks. If you would like to bring something edible to share with the group, you are invited to do so. If you would like to bring an animal to show off to the group, you are encouraged to do that as well. This will be a chance to socialize all evening and get to know your fellow members a little better.

The regular monthly meetings of the Chicago Herpetological Society take place at Chicago’s newest museum—the **Peggy Notebaert Nature Museum**. This beautiful building is at Fullerton Parkway and Cannon Drive, directly across Fullerton from the Lincoln Park Zoo. Meetings are held the last Wednesday of each month, from 7:30 P.M. through 9:30 P.M. Parking is free on Cannon Drive. A plethora of CTA buses stop nearby.

Board of Directors Meeting

Are you interested in how the decisions are made that determine how the Chicago Herpetological Society runs? And would you like to have input into those decisions? If so, mark your calendar for the next board meeting, to be held at 7:30 P.M., December 14, at the home of Linda and Andy Malawy in Naperville. If you wish to attend, please call Linda at (630) 717-9955..

The Chicago Turtle Club

The monthly meetings of the Chicago Turtle Club are informal; questions, children and animals are welcome. Meetings normally take place at the North Park Village Nature Center, 5801 N. Pulaski, in Chicago. Parking is free. For more info visit the group’s Facebook page.

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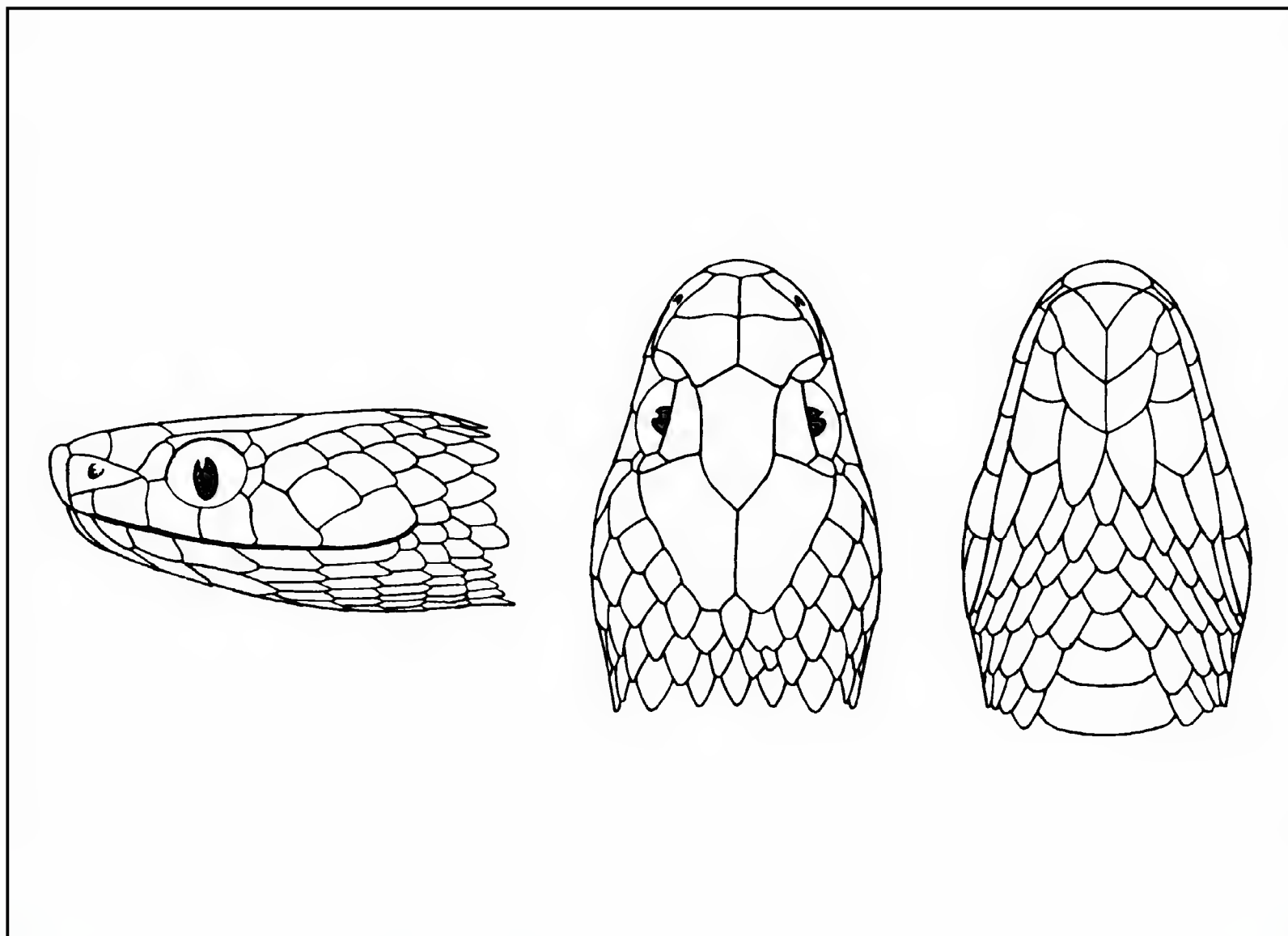
BULLETIN

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December 2012



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Notes on Mexican Herpetofauna 18: Herpetofauna of Cerro El Topo Chico Natural Protected Area, Nuevo León, Mexico	149
David Lazcano, Jorge Contreras-Lozano, Salvador Narváez-Torres and Jerónimo Chávez-Cisneros	
What You Missed at the November Meeting	156
John Archer	
Herpetology 2012	158
Unofficial Minutes of the CHS Board Meeting, November 16, 2012	159
Index to Scientific Names of Amphibians and Reptiles for Volume 47 (2012)	160
Author-Title Index for Volume 47 (2012)	162
Advertisements	164

Cover: Curl snake or myall, *Suta suta*. Drawing from *The Reptiles and Amphibians of South Australia* by Edgar R. Waite, 1929.

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The Chicago Herpetological Society is a nonprofit organization incorporated under the laws of the state of Illinois. Its purposes are education, conservation and the advancement of herpetology. Meetings are announced in this publication, and are normally held at 7:30 P.M., the last Wednesday of each month.

Membership in the CHS includes a subscription to the monthly *Bulletin*. Annual dues are: Individual Membership, \$25.00; Family Membership, \$28.00; Sustaining Membership, \$50.00; Contributing Membership, \$100.00; Institutional Membership, \$38.00. Remittance must be made in U.S. funds. Subscribers outside the U.S. must add \$12.00 for postage. Send membership dues or address changes to: Chicago Herpetological Society, Membership Secretary, 2430 N. Cannon Drive, Chicago, IL 60614.

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Notes on Mexican Herpetofauna 18: Herpetofauna of Cerro El Topo Chico Natural Protected Area, Nuevo León, Mexico

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Abstract

Cerro El Topo Chico is a protected Natural area at a state level. This Cerro is located within the Metropolitan Area of Monterrey in the municipalities of Monterrey and Escobedo. It is completely surrounded by city, now considered an artificial island. This is the first study herpetofauna in the area based on sampling and distribution maps. A recent forest fire severely affected much of the Cerro El Topo Chico, and a herpetological study was conducted to determine the status of populations. A total of 66 species are distributed in the general area: 16 amphibians and 50 reptiles. Five are endemic to Mexico and 20 are under a category of protection. It is important to continue with sampling subsequent to the forest fire in the area. Human impacts on the ecology of this artificial island can be expected to diminish genetic diversity and lead to extirpation of some species.

Resumen

El Cerro El Topo Chico, es un Área Natural Protegida a nivel estatal. Este cerro se ubica dentro del Area Metropolitana Area de Monterrey en los municipios de Monterrey y Escobedo. Se encuentra completamente rodeado por ciudad considerándose una isla artificial. Este es el primer estudio herpetofaunístico en el área en base a muestreos y mapas de distribución. Recientemente ocurrió un incendio que consumió casi en su totalidad el cerro, es por esto que realizar un estudio herpetológico es de importancia para determinar el estado de las poblaciones. Se reportaron 66 especies, repartidas en 16 anfibios y 50 reptiles. 5 son endémicas a México y 20 se encuentran bajo una categoría. Es de importancia continuar con los muestreos ya que el incendio sucedido, los impactos causados por el hombre y la condición de isla en que se encuentra es posible que las especies se encuentren en vías de extinguirse o una disminución de su pool genético.

Introduction

The Sierra Madre Oriental is a chain of mountains running north-south throughout eastern Mexico. This mountainous system occupies an area of 160,220.4 km², which is equivalent to about 8.2% of the country's territory, and varies in elevation from 200 to 3600 m (Luna et al., 2004). Several regionalization systems of Mexico, based on both physical and biotic criteria, show the Sierra Madre Oriental to have unique geographical and biological diversity (Lazcano et al., 2009). Canseco-Márquez et al.(2004) reported 207 species of amphibians and reptiles for the Sierra Madre Oriental: 44 frogs, 20 salamanders, 49 lizards, 88 snakes and 6 turtles.

Cerro El Topo Chico, part of the Sierra Madre Oriental, is located in the center of the state of Nuevo Leon. It has a total surface area of 1093.30 ha (10.933 km²), with a width of 2 km. It is a Protected Natural Area (ANP) at the state level (Anonymous, 2000). It can be viewed as a representative and emblematic symbol of the *regiomontano* landscape and an ecologically important zone that provides a diversity of environmental services and forms a refuge for the wildlife of our state (Anonymous, 2000). It is vital to intensely study this area.

No research on the amphibians and reptiles of Cerro El Topo Chico has been previously conducted and this is the first documentation on herpetofauna for this important State Protected Natural Area. Herpetologists who have worked very close to the site, now located within the Metropolitan Area of Monterrey, are: Martín del Campo (1953), Aseff-Martínez (1967), Velasco (1970), Contreras-Balderas et al.(1995), Lazcano et al.(2010); information and data have also been presented by Benavides-Ruiz (1987) for the municipality of Santiago; Banda-Leal (2002) and Lazcano et al.(2006) for Chipinque Ecological Park; and Gallardo-Valdez (2006) and Lazcano et al. (2009) for La Silla (Saddleback Mountain).

As a result of poor urban planning Cerro El Topo Chico is completely surrounded by the Metropolitan Area of Monterrey. Some urban development has encroached on the slopes. In addition, this *cerro* and the nearby Cerro las Mitras in the past have been exploited by the mining of construction material (limestone). This resulted in extreme erosion of some of the slopes. Mining had to be stopped because of flooding after strong hurricanes hit the city. Currently there is a minimum of industrial exploitation going on. Fortunately for the herpetofauna, the threat of flooding has stopped urban and industrial



A satellite view of Cerro El Topo Chico and the Monterrey Metropolitan Area. Source Google Earth 2012.

growth. However, urbanization has trapped the wildlife living here.

A recent threat was the fire that took place on the days of 25–28 April 2011, consuming 120 ha (nearly 11% of Cerro El Topo Chico), mainly microphyll scrub. It was a typical surface fire (Juan Carlos Pouda, pers. com.) strongly affecting flora and fauna. The response of amphibians and reptiles to anthropogenic disturbance to their microhabitats is scarcely studied and while most of the ecological relationships among these organisms are unknown, it is important to generate basic information about these communities to design management strategies (Osorno-

Muñoz, 1999).

It is crucial to assess the present herpetofauna for this important ANP Cerro El Topo Chico along elevation and vegetation zones. This will allow us to determine the current state of this *cerro*, which has been heavily impacted by human activities and isolated by population growth. It has become an artificial island and surely genetic variability and species are being lost.

Study site

The ANP Cerro El Topo Chico, is near the center of the state of Nuevo León. Politically it is part of the municipalities of Monterrey and General Escobedo. (INEGI, 1986); geographically it is located between 25°44'35" and 25°48'08" N latitude, and between 100°19' and 100°22'21" W longitude with elevation from 600 to 1170 m. It is located in the Sierra Madre Oriental.

Cerro El Topo Chico harbors a variety of vegetation types, mainly represented by submontane shrubs and microphyll. The representative elements of the vegetation in the natural area are: barreta (*Helietta parvifolia*), coyotillo (*Karwinskia humboldtiana*), hieba del potro (*Caesalpinia mexicana*), tenzon (*Pithecellobium pallens*), anacahuita (*Cordia boisieri*) and lechuguilla (*Agave lecheguilla*) (Anonymous, 2000).

According to the Köppen climate classification, modified by García (1981), the entire State Protected Natural Area is included in dry climate. This type of climate is characterized by evaporation exceeding precipitation; rains occurring in the summer



Cerro El Topo Chico in the distance, as seen from Escobedo, Nuevo León, Mexico. Photograph by Manuel Nevárez de los Reyes.

and scarce in the rest of the year. The total annual rainfall ranges between 300 and 500 mm, and the average annual temperature fluctuates between 18 and 22°C.

Field trips were conducted during the months of March, April, and July 2009–2011. We also reviewed the existing material in the preserved collection of the Laboratory of Herpetology of the Faculty of Biological Sciences/UANL and the distribution maps of species for their possible presence in Cerro El Topo Chico.

Individuals were captured and identified, and the following data were recorded: sex, date, time of observation, altitude, plant community, activity, substrate, geo-reference and the condition of the day.

Specimens were identified using the criteria of Smith and Taylor (1945, 1948, 1950), Conant and Collins (1998), Lazcano et al. (2010), Lemos-Espinal and Smith (2007) and the common and scientific names as updated by Liner and Casas-Andreu (2008).

Results

Seven species were recorded during the field trips to Cerro El Topo Chico. No additional material collected in the study area was found in the scientific preserved collection of the Laboratory of Herpetology of the Faculty of Biological Sciences/UANL. The latest information on the species occurring in the state of Nuevo León and distribution maps indicate the possible presence of 16 species of amphibians and 50 species of reptiles, which would be equivalent to the 49.62% of herpetofauna present in the state (Table 1).

Of the species listed in Table 1, three are exotic and five are endemic to Mexico. Twenty of the species have protected status under NOM-059-SEMARNAT-2010: eight as species of special concern and 12 as threatened species (SEMARNAT, 2010).

Discussion

Our research provides the first documentation of the herpetofauna on Cerro El Topo Chico. The list of 66 species in Table 1 was based on our sampling and on the distribution maps of Conant and Collins (1998), Lazcano et al. (2010), Lemos-Espinal and Smith (2007), López et al. (2009) and Elliott et al. (2009).

Many of the species of amphibians and reptiles listed in Table 1 have been documented for the Chipinque Ecological Park by Banda-Leal (2002) and Lazcano et al. (2006: 47 species); for the Cerro de la Silla (Saddleback Mountain) by Gallardo-Valdez (2006: 46 species) and Lazcano et al. (2009: 46 species); for the Sierra de Picachos by Contreras-Lozano et al. (2007: 47 species); for the Sierra San Antonio Peña Nevada by Lazcano et al. (2004: 32 species); and for Cerro El Potosí by Contreras-Lozano et al. (2010: 24 species).

With the fire that happened on 25–28 April 2011 it is possible that many of the species have suffered a decline in their populations. Fires create a mosaic of diverse wildlife habitat conditions, since they alter biotic and abiotic features of habitat (Cruz-Sáenz, 2008), resulting in sites with high species richness and others with very low diversity (Shipman et al., 2004). It is known that the main causes of extinction of amphibians and reptiles come from loss of habitat, changes in weather patterns, the introduction of exotic species and environmental pollution (Young et al., 2001). When optimum conditions are modified by the fragmentation of the forest, and is high intensity long-lasting disturbances to microhabitats occur, this can endanger amphibians that possess low ability of adaptation and dispersal (Blaustein and Wake, 1995; Pough, 1999; Rueda-Almonacid, 1999).

For species highly dependent on water such as amphibians and some reptiles, the effects of forest fires may be particularly severe, since after a fire the soils have reduced water storage capacity (due to the repellent layers that develop). Also compaction and erosion may occur and cause fluctuating surface temperatures (Kozłowski et al., 1991).

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A milksnake, *Lampropeltis triangulum*, from Cerro El Topo Chico. Photograph by Javier Banda-Leal.



Another inhabitant of Cerro El Topo Chico, a patch-nosed snake, *Salvadora grahamiae*. Photograph by Javier Banda-Leal.

Table 1. Possible species for Cerro El Topo Chico, Nuevo León, México, based on latest information and distribution maps († indicates species observed). Status codes: Pr = protected (special concern), A = threatened, SE = without status, NE = not endemic, EN = endemic, EX = exotic.

Taxon	Common Name	Status
Amphibia: Anura		
Family Bufonidae		
<i>Anaxyrus cognatus</i> (Say, in James, 1813)	Great Plains Toad	SE, NE
<i>Anaxyrus debilis</i> (Girard, 1854)	Green Toad	Pr, NE
<i>Anaxyrus punctatus</i> (Baird & Girard, 1851)	Red-spotted Toad	SE, NE
<i>Anaxyrus speciosus</i> (Girard, 1854)	Texas Toad	SE, NE
<i>Incilius nebulifer</i> (Girard, 1854)	Common Toad	SE, NE
<i>Rhinella marina</i> (Linnaeus, 1758)	Cane Toad	SE, EX
Family Craugastoridae		
<i>Craugastor augusti</i> (Dugès, in Brocchi, 1879)	Barking Frog	SE, NE
Family Leptodactylidae		
<i>Leptodactylus fragilis</i> (Brocchi, 1877)	White-lipped Frog	SE, NE
Family Eleutherodactylidae		
<i>Eleutherodactylus cystignathoides</i> (Cope,1877 [1878]) †	Rio Grande Chirping Frog	SE, NE
<i>Eleutherodactylus longipes</i> (Baird, in Emory, 1869)	Long-footed Chirping Frog	SE, NE
Family Hylidae		
<i>Smilisca baudinii</i> (Duméril & Bibron, 1841)	Mexican Treefrog	SE, NE
Family Microhylidae		
<i>Gastrophryne olivacea</i> (Hallowell, 1857(1856)	Western Narrow-mouthed Toad	SE, NE
Family Ranidae		
<i>Lithobates berlandieri</i> (Baird, 1854)	Rio Grande Leopard Frog	Pr, NE
Family Rhinophrynidae		
<i>Rhinophrynus dorsalis</i> A.M.C. Duméril & Bibron, 1841	Mexican Burrowing Toad	Pr, NE
Family Scaphiopodidae		
<i>Scaphiopus couchii</i> Baird, 1854	Couch’s Spadefoot	SE, NE
<i>Spea multiplicata</i> (Cope, 1863)	Western Spadefoot	SE, NE
Reptilia: Testudines		
Family Testudinidae		
<i>Gopherus berlandieri</i> (Agassiz, 1857) †	Texas Tortoise	A, NE
Reptilia: Squamata—Lizards		
Family Crotaphytidae		
<i>Crotaphytus collaris</i> (Say, 1813)	Eastern Collared Lizard	A, NE
Family Eublepharidae		
<i>Coleonyx brevis</i> Stejneger, 1893	Texas Banded Gecko	Pr, NE
Family Gekkonidae		
<i>Hemidactylus turcicus</i> (Linnaeus, 1758) †	Mediterranean House Gecko	SE, EX
Family Phrynosomatidae		
<i>Cophosaurus texanus</i> Troschel, 1852(1850)	Greater Earless Lizard	A, NE
<i>Phrynosoma cornutum</i> (Harlan, 1824 [1825])	Texas Horned Lizard	SE, NE
<i>Phrynosoma modestum</i> Girard, 1852	Round-tailed Horned Lizard	SE, NE
<i>Sceloporus consobrinus</i> Baird & Girard, 1853	Prairie Lizard	SE, NE
<i>Sceloporus couchii</i> Baird, 1859(1858)	Couch’s Spiny Lizard	SE, EN
<i>Sceloporus grammicus</i> Wiegmann, 1828	Graphic Spiny Lizard	Pr, NE
<i>Sceloporus marmoratus</i> Hallowell, 1852	Northern Rose-bellied Lizard	SE, NE
<i>Sceloporus olivaceus</i> H. M. Smith, 1934	Texas Spiny Lizard	SE, NE
<i>Sceloporus ornatus</i> Baird, 1859 (1858)	Ornate Spiny Lizard	A, EN

Table 1 (cont'd).

Taxon	Common Name	Status
<i>Sceloporus parvus</i> H.M. Smith, 1934	Blue-bellied Lizard	SE, EN
<i>Sceloporus serrifer</i> Cope, 1866 †	Rough-scaled Lizard	SE, NE
Family Scincidae		
<i>Plestiodon brevirostris</i> (Günter,1860)	Short-nosed Skink	SE, NE
<i>Plestiodon tetragrammus</i> Baird, 1858	Four-lined Skink	SE, NE
Family Teiidae		
<i>Aspidoscelis scalaris</i> (Cope,1892)	Texas Spotted Whiptail	SE, NE
Reptilia: Squamata—Snakes		
Family Colubridae		
<i>Arizona elegans</i> Kennicott in Baird, 1859	Glossy Snake	SE, NE
<i>Bogertophis subocularis</i> (A.E.Brown,1901)	Southern Trans-Pecos Ratsnake	SE, EN
<i>Coluber constrictor</i> Linnaeus, 1758	North American Racer	A, NE
<i>Coluber flagellum</i> Shaw, 1802	Coachwhip	A, NE
<i>Coluber schotti</i> (Baird & Girard, 1853)	Schott’s Whipsnake	SE, NE
<i>Coluber taeniatus</i> Hallowell,1852	Striped Whipsnake	SE, NE
<i>Diadophis punctatus</i> (Linnaeus, 1766)	Ring-necked Snake	SE, NE
<i>Drymarchon melanurus</i> (A.M.C.Duméril, Bibron & A.H.A. Duméril, 1854)	Central American Indigo Snake	SE, NE
<i>Ficimia streckeri</i> E.H. Taylor, 1931	Tamaulipan Hook-nosed Snake	SE, NE
<i>Gyalopion canum</i> Cope, 1861 (1860)	Chihuahuan Hook-nosed Snake	SE, NE
<i>Heterodon kennerlyi</i> Kennicott, 1860	Mexican Hog-nosed Snake	SE, NE
<i>Hypsiglena jani</i> (Dugès, 1865)	Texas Nightsnake	SE, NE
<i>Lampropeltis alterna</i> (A.E. Brown, 1901)	Gray-banded Kingsnake	A, NE
<i>Lampropeltis getula</i> (Linnaeus, 1766)	Common Kingsnake	A, NE
<i>Lampropeltis triangulum</i> (Lacépède, 1789) †	Milksnake	A, NE
<i>Leptodeira septentrionalis</i> (Kennicott, in Baird, 1859)	Northern Cat-eyed Snake	SE, NE
<i>Opheodrys aestivus</i> (Linnaeus, 1766)	Rough Greensnake	SE, NE
<i>Pantherophis emoryi</i> (Baird & Girard, 1853)	Great Plains Ratsnake	SE, NE
<i>Pituophis catenifer</i> (Blainville, 1835)	Gopher Snake	SE, NE
<i>Rhinocheilus lecontei</i> Baird & Girard, 1853	Long-nosed Snake	SE, NE
<i>Salvadora grahamiae</i> Baird & Girard, 1853 †	Eastern Patch-nosed Snake	SE, NE
<i>Sonora semiannulata</i> Baird & Girard, 1853	Western Groundsnake	SE, NE
<i>Storeria dekayi</i> (Holbrook,1836)	Texas Brownsnake	SE, NE
<i>Tantilla atriceps</i> (Günther, 1895 in Salvin & Godman, 1885-1902) †	Mexican Black-headed Snake	A, NE
<i>Thamnophis marcianus</i> (Baird & Girard, 1853)	Checkered Gartersnake	A, NE
<i>Thamnophis proximus</i> (Say, in James, 1823)	Arid Land Ribbonsnake	A, NE
Family Elapidae		
<i>Micrurus tener</i> (Baird & Girard, 1853)	Texas Coralsnake	SE, NE
Family Leptotyphlopidae		
<i>Rena dulcis</i> (Baird & Girard, 1853)	Texas Threadsnake	SE, NE
<i>Rena myopicus</i> (Garman, 1884[(1883)])	Tampico Threadsnake	SE, EN
Family Typhlopidae		
<i>Ramphotyphlops braminus</i> (Daudin,1803)	Brahminy Blindsnake	SE, EX
Family Crotalidae		
<i>Crotalus atrox</i> Baird & Girard, 1853	Western Diamondback Rattlesnake	Pr, NE
<i>Crotalus lepidus</i> (Kennicott, 1861)	Rock Rattlesnake	Pr, NE
<i>Crotalus molossus</i> Baird & Girard, 1853	Black-tailed Rattlesnake	Pr, NE

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What You Missed at the November Meeting

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November meetings are not as well attended as others, but we continue to have really good speakers, so I'm confused as to why. The elections usually go quickly and are in themselves an important part of your society, so why not attend? We still have a raffle with some really valuable prizes; you still can mix with others of a like mind; you still have an opportunity of seeing and interacting with some really interesting animals; you still have the pleasure of hearing terrific presentations.

For those of you who have kids, your society has started a Jr. Herp Society just for them. There are crafts, animals, and speakers just for kids with the targeted ages being 8–12, but nearly any age welcome. Meetings will be held at the Peggy Notebaert Nature Museum from noon to 1 P.M. on Sunday of the first full weekend of each month. This coincides with the weekend we have animals on display at the museum. We will usually meet in the Notebaert's education room on the second floor. Admission to the museum is waived for participants, but only to attend the Jr. Herp meeting, not to wander the museum. If you have kids who are interested in your hobby, this is the place to take them.

When I arrived at the November meeting, I approached a person I had never met but from photos I was pretty sure was Julie tenBensel. I liked her immediately when I asked if she had a PowerPoint I could copy. She looked at me and said, "I don't do PowerPoint." No, Julie doesn't do PowerPoint. She just brings animals. A half-dozen or so cages, all nicely decorated, and a large wired enclosure held the subjects of her talk. She was going to speak about the care and feeding of monitors (*Varanus* spp.) and her visual aids were alive and moving. The time and energy she put in to bringing those animals to our meeting demonstrated not only her desire to deliver a first rate presentation but also her appreciation of the lizards, all of which



Julie tenBensel enthralled by a rare "type 2" albino water monitor (*Varanus salvator*). Photograph by Erika N. Chen-Walsh.

she treated with care and obvious affection. During our short conversation prior to the meeting she expressed her doubts about the quality of her upcoming performance because she had put it together rather hastily. She needn't have worried. In spite of occasionally having to interrupt her speaking to return an errant argus monitor (*Varanus panoptes*) to its enclosure, she delivered an informative and delightful presentation.

Autobiographically speaking, Julie proclaims a lifelong fondness for animals and a yearning to be a zoologist, but circumstances led her to the corporate world for a living. She's raised and sold chameleons and even started a clothing line, but now concentrates on monitors. She began with a short explanation of monitor evolution, mentioning the largest discovered so far, the extinct megalania (*V. priscus*). Monitors range from Africa through the Middle East, India, Asia, Indonesia, and down to Australia, with African species tending to be larger and Indonesia and Australia having a wider variety of species. General body plan of a monitor is a long slender body with a thin neck and robust legs tipped with strong claws. Julie offered to show us her scars as proof of their powerful claws. Ground-dwelling species tend to have strong semi-prehensile tails while the arboreal species have very prehensile tails. All have good eyesight, excellent smell and poor hearing, and all are good climbers and swimmers. Most exhibit bipedalism on occasion, standing on back legs to survey the terrain, and able to run short distances in that upright attitude. They tend to be diurnal and highly active with large home ranges. A study of white-throated monitors (*V. albigularis*) has demonstrated an ability to recognize numbers up to six, and all keepers and students of these animals will testify to their high intelligence.

In captivity monitors thrive on variety and space, with the



Two of Julie's argus monitors (*Varanus panoptes*) enjoying each other's company. Photograph by Julie tenBensel.



We saw one of these emerald tree monitors (*Varanus prasinus*) at the meeting. Photograph by Julie tenBensel.



An argus monitor looking engaged and intelligent as do most monitors. Photograph by Julie tenBensel.

larger species needing at least an 8' × 8' × 8' cage. Babies do better in smaller cages. All will use climbable features, and all enjoy burrowing, confining hides, and ambient temperatures from 80 to 100°F with hot spots of 100–130°F. Julie uses lots of platforms and UVB lights for all her animals, especially the arboreal species and babies. She feeds a variety of foods, with raw chicken and turkey as the staple being supplemented with whole fish, hard-boiled eggs, the occasional mouse, and even turkey dogs. All monitors available in the pet trade are carnivores, though some of the smaller species occasionally eat fruit. Babies of the smaller species start out on insects. She feeds every day in the summer, but stresses that it is easy to overfeed, especially the savannah monitors (*V. exanthematicus*) that seem to have slower metabolisms than their kin. The animals are very messy eaters. Julie stressed that monitors are not good first-time pets. They are usually difficult to handle and expensive to keep.

Then she brought out her visual aids, answering questions and telling anecdotes. Your president Jason Hood, who had been busily returning the two argus monitors to their cage every time they attempted to explore outside the confines of their pen, glanced pensively at his hands when Julie mentioned that argus monitors can rip a person's hand off. Jason retained all of his appendages. All the animals that Julie brought seemed docile, though she used gloves with some. In addition to the argus monitors, she brought out a gorgeous little black-and-white Timor monitor (*V. timorensis*) followed by an emerald tree monitor (*V. prasinus*) displaying bright-green coloring set off by a reddish-striped back. Along with mentioning hand-destroying capabilities, Julie included snippets of facts of all the animals, mentioning that crocodile monitors (*V. salvadorii*) are notoriously aggressive and can grow longer than Komodo dragons (*V. komodoensis*), which are considerably milder in temperament.



This baby water monitor (*Varanus salvator*) may grow from a handful to become 8 or 9 feet long. Photograph by Julie tenBensel.

She answered questions about her specific husbandry and included other ways of keeping monitors. She told of leaping to her feet and rushing to her animal room a few times before she realized that when her monitors elected to vacate the multi-level platforms in their cages, they almost always simply jumped, landing with a huge thud and shaking the house. She stressed the advantages of captive-bred animals, and emphasized the need to carefully check out claims of captive-bred for many of the species. While she warned that monitors are not pets for beginners, she did say that ackies (*V. acanthurus*) or Timors are reasonable starter monitors. She was asked what her dream monitor would be, and without hesitation she replied, “perentie.”

So at November's meeting we elected another fine board for your society, got to try for some terrific prizes in the raffle, mingled with people we may only see once a month, and were able to get close and personal with animals that are beautiful, intelligent and fascinating. And we listened to a knowledgeable speaker who shared her insights into monitor care and habits while quite obviously displaying her real affection for this genus. And you're missing all that?

Herpetology 2012

In this column the editorial staff presents short abstracts of herpetological articles we have found of interest. This is not an attempt to summarize all of the research papers being published; it is an attempt to increase the reader's awareness of what herpetologists have been doing and publishing. The editor assumes full responsibility for any errors or misleading statements.

NEW RATTLESNAKE SPECIES

C. G. Anderson and E. Greenbaum [2012, Herpetological Monographs 26:19-57] note that the black-tailed rattlesnake (*Crotalus molossus*) is a wide-ranging species complex with representatives from the southwestern United States through the highlands of central and southern Mexico. The systematics of this group has received little attention and in the past six decades only two taxonomic changes have been proposed (the transfer of *C. basiliscus oaxacus* to *C. molossus* and the elevation of *C. m. estebanensis* to full species). However, a recent revision of the Neotropical rattlesnakes (*C. durissus* and *C. simus*) recovered a polyphyletic *C. molossus*. The authors sequenced data from three mitochondrial genes (ATPases 8 and 6, cyt b, and ND4) and three nuclear genes (c-mos, EXPH5, and RAG1) to examine phylogenetic relationships among *C. molossus* lineages and the closely related species *C. basiliscus* and *C. totonacus*. Results recovered strong support for two deeply divergent northern *C. molossus* lineages that are morphologically distinct. Biogeographical patterns and divergence dates inferred from mitochondrial data suggest the diversification of *C. molossus* is the result of a Neogene vicariance event associated with uplift of the Sierra Madre Occidental. Population-level analyses suggest that major lineages of *C. molossus* have been stable since their initial divergence. On the basis of morphological and molecular evidence the authors resurrect the name *Crotalus ornatus* Hallowell, 1854, for black-tailed rattlesnake populations in the Chihuahuan Desert and central Texas.

LONG-TERM TWIN-SPOTTED RATTLESNAKE STUDY

D. B. Prival and M. J. Schroff [2012, Herpetological Monographs 26:1-18] conducted a 13-yr study of *Crotalus pricei* in Arizona's Chiricahua Mountains, capturing 306 individual snakes and recapturing snakes on 155 occasions. Juveniles shed and fed more frequently and grew more quickly than adults. Spiny lizard (*Sceloporus*) scales were found in 78% of fecal samples, making *Sceloporus* the most common prey item for both juveniles and adults. Males became larger than females at 5 yr of age, a year or two after females reached reproductive size. Although 45% of adult females were gravid, reproduction was not typically biennial and larger snakes were more likely to be gravid than smaller adult snakes. Survival rate (mean $\pm$ SE) at the most-studied site was 0.707 ± 0.0334 and detectability was 0.309 ± 0.0386 ; detectability was positively correlated with number of search hours and negatively correlated with dry weather. Mean population size at this site was 67 snakes, and there was no evidence of a population decline over the course of the study. However, age class structure was skewed toward younger snakes at the site, probably due to illegal collection of snakes for the pet trade.

PYGMY RATTLESNAKE GROWTH PATTERNS

P. G. May and T. M. Farrell [2012, Herpetological Monographs 26:58-79] studied growth in snout-vent length (SVL) and body mass of dusky pygmy rattlesnakes (*Sistrurus miliarius barbouri*) in Volusia County, Florida, with the use of mark-recapture techniques. Between February 1992 and December 2000, these authors PIT-tagged 665 individuals of approximately 1 yr of age or greater that were subsequently recaptured at least once. Because snakes can be definitively aged at 1 yr, this resulted in a large sample of snakes of known age that were followed for up to 7 yr. Seventy-five of these individuals PIT-tagged at 1 yr were identified from photographs of neonates born in captivity, allowing relation of adult growth to neonate traits. The data suggest that pygmy rattlesnakes in central Florida exhibit highly variable patterns of growth that are related to a mild climate that allows feeding and growth throughout the year, and to a fluctuating prey base that results in irregular growth patterns often unlike those predicted by typical growth equations such as the von Bertalanffy model. Snakes in the study populations were surface-active throughout the year, and snakes with detectable prey in the gut were found in all months. Growth is most rapid in the first year, but growth rates did not differ markedly from other viperids occurring in more temperate areas. In their first year, pygmy rattlesnakes in Florida increased their mass over birth on average more than fourfold, and increased SVL 1.8-fold. Growth in both mass and SVL continued throughout life, with no clear indication of an asymptote in size. Multiple regressions of SVL and body mass against age showed a slight but significant effect of sex on both SVL and mass, though these differences were not apparent until snakes were approximately 4 yr. Males and females showed no difference in SVL growth rates or patterns of change in growth rate with age, but females grew faster in body mass than males. Body-mass growth rates did not decline with age in either sex. Rates of increase in SVL in the first year of life differed significantly among years, though these differences were not correlated with estimates of prey (frog) abundance. However, neither body size at birth or first-year growth rates was significantly related to size at 1 yr of age or with growth rates later in life. Inspection of individual growth records and characterization of records into categories defined here showed great variability in patterns of growth, with episodic growth occurring in most individuals, including larger adults. A year-round activity season may decouple feeding and growth in these snakes from the temporal constraints imposed on more northern snakes, resulting in greater variability in individual growth trajectories. Prolonged feeding opportunities may allow snakes with below-average feeding conditions in their first year to compensate for slower initial growth by opportunistic feeding and rapid bouts of growth at any time later in life.

Unofficial Minutes of the CHS Board Meeting, November 16, 2012

The meeting was called to order at 7:56 P.M. at the Schaumburg Public Library. Board members Lawrence Huddleston, Deb Krohn and Aaron LaForge were absent.

Officers' Reports

Recording Secretary: The minutes of the October 19, 2012, board meeting were read and accepted.

Treasurer: The October financial report was presented, discussed and accepted.

Membership Secretary: Membership numbers are holding steady around 500. A list of newly expired memberships was read.

Sergeant-at-arms: Attendance at the October general meeting was 28.

Committee Reports

Shows:

- Notebaert, first full weekend of each month. Josh Chernoff is coordinator.
- Great Lakes Pet Expo, Wisconsin Exposition Center, Milwaukee, February 2, 2013.
- Chicagoland Family Pet Expo, Arlington Park Racecourse, March 15–17, 2013.

Old Business

Junior Herpers club: Background checks on volunteers have been completed. Jason will review them

New Business

The board discussed what benefits the families of the junior herp club members can or should receive.

The December 14 board meeting will be a potluck at the home of the Malawys.

Round Table

Mike Scott had a good time at SEWERfest.

Cindy has a new job at The Reptile Report Marketplace

Nancy Kloskowski also thought SEWERfest was nice.

Dick Buchholz is heading for Houston and will be gone for the November general meeting and the December Notebaert weekend.

Stephanie Capiello's turtles recently got new cages.

The meeting was adjourned at 9:16 P.M.

Respectfully submitted by recording secretary Jenny Vollman



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RATS AND MICE

Index to Scientific Names of Amphibians and Reptiles for Volume 47 (2012)

January 1-16	April 45-56	July 81-96	October 121-136
February 17-32	May 57-68	August 97-108	November 137-148
March 33-44	June 69-80	September 109-120	December 149-164
Acrochordus javanicus 66	Cnemidophorus murinus 37	andiana 103, 104	frenatus 116
Agalychnis	Coleonyx brevis 152	nicholsi 93	turcicus 40, 152
anna 26	Coluber	Dipsosaurus dorsalis 110	Heterodon
callidryas 26	bilineatus 23	Drymarchon	kennerlyi 153
moreletii 26	constrictor 153	couperi 12	platirrhinos 144
saltator 26	flagellum 22, 23, 114, 153	melanurus 24, 153	Hierophis viridiflavus 146
spurrelli 26	mentovarius 24	rubidus 39, 40	Hoplodactylus delcourti 77
Agkistrodon	schotti 152	Drymobius margaritiferus 24	Hyalinobatrachium valerioi 103
browni 41	taeniatus 114, 152	Elaphe	Hydrophis parviceps 95
contortrix mokasen 62	Cophosaurus texanus 37, 152	bairdi 106	Hyla
Alligator mississippiensis 51	Corallus hortulanus 105	obsoleta 66, 106	arenicolor 23
Ambystoma	Cordylus	lindheimeri 106	chrysoscelis 13, 27, 63
laterale 6	cataphractus 33	Eleutherodactylus	eximia 23, 38
macrodactylum 94	giganteus 33	cystignathoides 152	versicolor 6
maculatum 62, 97	Craugastor	longipes 152	Hypopachus variolosus 23
Amphisbaena varia 103	augusti 23, 152	Elgaria kingii 23, 114	Hypsiboas
Amyda cartilaginea 66	hobartsmithi 23	Emydoidea blandingii 27	boans 103, 105
Anaxyrus 99	occidentalis 23	Eretmochelys imbricata 106	picturatus 103
americanus 6, 13, 63, 98	Crocodylus	Eunectes murinus 4	Hypsiglena
cognatus 152	johnstoni 145	Fejervarya cancrivora 28	chlorophaea chlorophaea 38
debilis 152	porosus 27	Ficimia streckeri 153	jani 153
punctatus 38, 152	Crotalus	Gambelia wislizenii 37	torquata 24
speciosus 152	atrox 113, 153	Gastrophryne	Incilius nebulifer 152
Anolis	basiliscus 22, 24, 158	olivacea 152	Indotestudo elongata 19
carolinensis 94	oaxacus 158	mazatlanensis 38	Kinosternon
fraseri 103	cerastes 113	Gekko gekko 66, 78	flavescens 145
sagrei 94	cerberus 113, 114	Geochelone platynota 19	integrum 24
Arizona elegans 153	durissus 158	Geophis dugesii aquilonaris 38	sonoriense 38
Aspidoscelis	horridus 145	Gopherus	Kinyongia
communis 23	lepidus 153	agassizii 40, 94, 106	adolffriderici 28
costata 23	molossus 113, 153, 158	berlandieri 152	gyrolepis 28
gularis 23	estebanensis 158	flavomarginatus 146	Lachesis acrochorda 105
lineatissima 23	nigrescens 38	morafkai 113	Lampropeltis
scalaris 153	oreganus 12	polyphemus 106, 118	alterna 153
Boa	lutosus 114	Graptemys 57-62	getula 153
constrictor 4, 23	ornatus 158	barbouri 57	getula 145
imperator 40	pricei 158	caglei 57, 60	triangulum 24, 153
Bogertophis subocularis 153	ruber 93	ernsti 57	triangulum 137-139
Bolitoglossa biseriata 103	scutulatus 113	flavimaculata 57, 60	sinaloae 40
Bothriechis schlegelii 103	simus 158	geographica 57, 145	zonata 114
Bothriopsis 105	stephensi 114	gibbonsi 57, 60	Leiolepis guttata 41
Bothrocophias hyoprora 105	tigris 113	gibbsoni 60	Lepidochelys olivacea 27, 116
Bothrops atrox 105	totonacus 158	nigrinoda 57	Lepidodactylus lugubris 116
Broghammerus reticulatus 1	willardi silus 38	oculifera 57, 60	Leptodactylus fragilis 152
Bufo 99	Crotaphytus collaris 36, 152	ouachitensis 57	Leptodeira septentrionalis 153
houstonensis 13	Cryptobranchus	pearlensis 60	Lichanura trivirgata 54
Caecilia	alleganiensis bishopi 54, 93	pseudogeographica 57	Limnodynastes
gracilis 66	Ctenosaura pectinata 22, 23	pulchra 57	dumerili 27
nigricans 103	Cuora mouhotii 13	versa 57	peronii 27
Carphophis amoenus amoenus 63	Dendrobates auratus 13	Gyalopion canum 153	Liolaemus poecilochromus 94
Cerrophidion barbouri 41	Dermatemys mawii 118	Heloderma	Lithobates 99
Chelonia mydas 14, 28, 81-88	Desmognathus fuscus 118	horridum 23	areolatus 144
Chelus fimbriata 104, 105	Diadophis punctatus 153	exasperatum 40	berlandieri 22, 23, 152
Chelydra serpentina 6, 66	Diploglossus monotropis 103	suspectum 114	catesbeianus 22, 23, 63
Chrysemys picta 62	Dipsas 93	Hemidactylus	chiricahuensis 144

forreri 23	Paleosuchus trigonatus 105	margaritifera 104	ornata 117
megapoda 23	Pantherophis	marina 23, 27, 152	Thamnophis
neovolcanicus 23	emoryi 24, 153	Rhinocheilus	cyrtopsis 24
palustris 13	gloydi 95	lecontei 153	cyrtopsis 38
pipiens 6	vulpinus 95	antonii 40	marcianus 153
septentrionalis 27	Phrynosoma	Rhinoderma darwinii 54	proximus 153
sphenocephalus 63	blainvillii 110	Rhinophrynus dorsalis 152	scaliger 14
sylvaticus 6, 13, 14, 146	cornutum 152	Salvadora	sirtalis 6, 97-98
Litoria	coronatum 110	grahamiae 153	Trachemys
genimaculata 27	hernandesi 37	mexicana 24	scripta
lesueuri 27	modestum 34-36, 152	Scaphiopus couchii 152	elegans 58, 59, 145
nannotis 27	platyrhinos 89-91	Sceloporus 158	scripta 58
Lophognathus temporalis 144	Phyllodactylus	albiventris 23	scripta × elegans 59, 60
Macropisthodon rudis 146	homolepidurus 40	clarkii 23	Trachyboa boulengeri 103, 104
Malaclemys terrapin 66	lanei 23	consobrinus 152	Trimorphodon
Manolepis putnami 24	tuberculosis 23	couchii 152	biscutatus 22, 24
Mauremys	Phyllomedusa tomopterna 105	graciosus 35, 110	lambda 113
japonica 14	Philodryas nattereri 54	grammicus 152	tau 24
reevesii 14	Pipa pipa 104, 105	heterolepis 23	tau 38
Mesotriton alpestris 66	Pituophis	horridus 23	Uroplatus lineatus 77
Micrurus	catenifer 153	magister 37	Urosaurus
distans 24	deserticola 106	marmoratus 152	bicarinatus 23
distans 39, 40	sayi 95	melanorhinus 23	graciosus 109-111
tener 153	Plestiodon	occidentalis 110	Uta stansburiana 36
Mixcoatlus 41	brevorostris 153	olivaceus 152	Varanus
barbouri 41	callicephalus 23, 141-143	ornatus 152	acanthurus 157
browni 41	septentrionalis 141	parvus 153	albigularis 156
melanurus 41	tetragrammus 153	scalaris 23	exanthematicus 157
Naja 17	Plethodon	serrifer 153	komodoensis 157
Natator depressus 27	cinereus 62, 97	tristichus 36-37	panoptes 156
Natrix natrix 28	glutinosus 97	utiformis 23, 24	prasinus 156, 157
Naultinus gemmeus 95	Podarcis muralis 146	vandenburgianus 35, 110	priscus 156
Nerodia	Potomites 105	Scincella lateralis 138	salvadorii 157
sipedon	Pristimantis 103	Sibon	salvator 156, 157
pleuralis 140	eriphus 102	annulatus 93	timorensis 157
sipedon 140	Pseudacris	argus 93	
Norops nebulosus 23	crucifer 6, 63	longifrenis 93	
Notophthalmus viridescens 98	regilla 95, 117	nebulatus 93	
Nyctimystes dayi 27	triseriata 6	Sistrurus miliarius barbouri 158	
Ollotis	Pseudemys concinna hieroglyphica 59	Smaug giganteus 33	
alvaria 114	Pseustes shropshirei 103	Smilisca	
marmorea 40	Python	baudinii 23, 40, 152	
mazatlanensis 23, 40	bivittatus 1-6, 69-76	fodiens 23	
occidentalis 23	brongersmai 73	Sonora semiannulata 153	
Oophaga	molurus 1, 4, 5, 69, 71-75	Spea multiplicata 23, 152	
granulifera 13	bivittatus 9, 69	Sphaerodactylus ariasae 77	
sylvatica 103	reticulatus 66	Storeria	
Opheodrys aestivus 153	Pyxicephalus adspersus 41, 67	dekayi 12, 153	
Ophiophagus hannah 17-20	Quedenfeldtia	occipitomaculata 93	
Ophryacus	moerens 7	Syrrhophus	
melanurus 41	trachyblepharus 7-8	modestus 23	
undulatus 41	Ramphotyphlops braminus 24, 153	nitidus 23	
Osteocephalus duellmani 41	Rana 99	Tantilla	
Ouroborus cataphractus 33	luteiventris 95	atriceps 153	
Oxybelis aeneus 24, 39, 40	Rena	bocourti 24	
Oxyrhopus	dulcis 153	calamarina 24	
formosus 105	myopicus 153	Tarentola 78	
petolarius 105	Rhabdophis tigrinus 146	Terrapene	
Pachymedusa	Rhinella	carolina 13	
dacnicolor 23, 24, 39, 40		nelsoni nelsoni 39, 40	

Author–Title Index for Volume 47 (2012)

January 1-16	April 45-56	July 81-96	October 121-136
February 17-32	May 57-68	August 97-108	November 137-148
March 33-44	June 69-80	September 109-120	December 149-164
Archer, J.	What You Missed at the February Meeting		38
Archer, J.	The Tympanum: Requiem for a Lightweight		42
Archer, J.	What You Missed at the March Meeting		51
Archer, J.	What You Missed at the May Meeting		77
Archer, J.	What You Missed at the July Meeting		99
Archer, J.	What You Missed at the August Meeting		113
Archer, J.	What You Missed at the September Meeting		131
Archer, J.	What You Missed at the November Meeting		156
Barker, D. G., S. L. Barten, J. P. Ehram and L. Daddono	The Corrected Lengths of Two Well-known Giant Pythons and the Establishment of a New Maximum Length Record for Burmese Pythons, <i>Python bivittatus</i>		1
Barker, D. G., and T. M. Barker	The Tympanum: Invading to the South: Comments on Research on Salinity Tolerance of Burmese Pythons		9
Barker, D. G., and T. M. Barker	A Review of: Dorcas et al. 2012. <i>Severe Mammal Declines Coincide with Proliferation of Invasive Burmese Pythons in Everglades National Park</i>		45
Barker, D. G., and T. M. Barker	A Discussion of Two Methods of Modeling Suitable Climate for the Burmese Python, <i>Python bivittatus</i> , with Comments on Rodda, Jarnevich and Reed (2011)		69
Barker, T. M.	See Barker, D. G.		
Barten, S. L.	See Barker, D. G.		
Breese, P.	Letter		92
Burger, R. M.	A Brief Note on Reproduction in Morelet’s Leaf Frog, <i>Agalychnis moreletii</i> (Duméril)		26
Chávez-Cisneros, J.	See Lazcano, D.		
Cochran, P. A.	The Significance of an “Insignificant” Wetland in Brown County, Wisconsin		6
Contreras-Lozano, J.	See Lazcano, D.		
Cruz-Sáenz, D.	See Flores-Cobarrubias, E.		
Cruz-Sáenz, D.	See also Penilla-Juárez, Á.		
Daddono, L.	See Barker, D. G.		
Ehram, J. P.	See Barker, D. G.		
Flores-Cobarrubias, E., D. Cruz-Sáenz and D. Lazcano	Notes on the Herpetofauna of Western Mexico 6: Amphibians and Reptiles of Hostotipaquillo, Jalisco, Mexico		21
Fogel, G.	Armadillo Lizards and Sungazers: The Names Are Changed but the Lizards Remain the Same		33
Goldberg, S. R.	Notes on Reproduction in Atlas Day Geckos, <i>Quedenfeldtia trachyblepharus</i> (Squamata: Gekkonidae) from Morocco		7
Goldberg, S. R.	Notes on Reproduction in Roundtail Horned Lizards, <i>Phrynosoma modestum</i> (Squamata: Phrynosomatidae) from New Mexico		34
Goldberg, S. R.	Notes on Reproduction of Desert Horned Lizards, <i>Phrynosoma platyrhinos</i> (Squamata: Phrynosomatidae) from Southern California		89
Goldberg, S. R.	Notes on Reproduction of Long-tailed Brush Lizards, <i>Urosaurus graciosus</i> (Squamata: Phrynosomatidae) from California		109
Gray, B. S.	A Note on the Diet of Common Garter Snakes, <i>Thamnophis sirtalis</i> , in Pennsylvania		97
Johnson, S. R.	Historical Sightings and Recent Surveys of the Herpetofauna of the James River Park System		62
Johnson, S. R., and M. Stark	An Exploration of the Lizard Community at Homolavi State Park with Notes on Predator Signaling in Plateau Fence Lizards		36
Johnson, S. R., and M. Stark	The Hole in the Wall Gang		140

Lazcano, D., J. Contreras-Lozano, S. Narváez-Torres and J. Chávez-Cisneros Notes on Mexican Herpetofauna 18: Herpetofauna of Cerro El Topo Chico Natural Protected Area, Nuevo León, Mexico	149
Lazcano, D. See also Flores-Cobarrubias, E.	
Lazcano, D. See also Penilla-Juárez, Á.	
Lee, D. S. The Future of Map Turtles: Will the Mutts Take Over?	57
Lee, D. S. The Key West Turtle Kraals Museum—But a Short Step Back in Time	81
Lee, D. S. Hot Tracks, Fast Turtles—The Unforeseen Consequences of Well-intended Turtle Derbies	121
Narváez-Torres, S. See Lazcano, D.	
Newman, D. Book Review: <i>The Lizard King, The True Crimes and Passions of the World's Greatest Reptile Smugglers</i> by Bryan Christy	112
Palis, J. G. Book Review: <i>The Amphibians and Reptiles of Michigan: A Quaternary and Recent Faunal Adventure</i> by J. Alan Holman	99
Penilla-Juárez, Á., D. Cruz-Sáenz and D. Lazcano Notes on the Herpetofauna of Western Mexico 7: Reproduction of <i>Plestiodon callicephalus</i> in Jalisco, Mexico	141
Platt, S. G., Win Ko Ko and T. R. Rainwater On the Cobra Cults of Myanmar (Burma)	17
Rainwater, T. R. See Platt, S. G.	
Stark, M. See Johnson, S. R.	
Steinle, C. The Tympanum: A Challenge to Every Reptile Keeper	10
Steinle, C. The Tympanum: When People Ask You Why You Keep Reptiles, Tell Them	29
Steinle, C. The Tympanum: Of Pythons and Pit Bulls: Pushing Back against Media Bias	53
Wallach, V. Two-headed Snakes Make High Maintenance Pets	137
Win Ko Ko See Platt, S. G.	
Zeh, D. Letter	64

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For sale: rats and mice—pinkies, fuzzies and adults. Quantity discounts. Please send a SASE for pricelist or call Bill Brant, *THE GOURMET RODENT*, PO Box 430, Newberry, FL 32669-0430, 352-472-9189, E-mail: GrmtRodent@aol.com.

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For sale: High quality, all locally captive-hatched tortoises, all bred and hatched here in the upper midwest. Baby leopards, Sri Lankan stars, and pancakes usually available, and are all well-started and feeding great! Leopards are \$125 ea., Sri Lankans (2012 hatched) \$475 ea. And Pancakes are \$195 ea. Leopards for out of state sale/shipping require a veterinary health certificate (inquire for cost). E-mail at KKranz1@wi.rr.com or call Jim or Kirsten at 262 654 6303.

Herp tours: **Costa Rica herping adventures**. Join a small group of fellow herpers for 7 herp-filled days. We find all types of herps, mammals, birds, and insects, but our target is snakes. We average 52 per trip, and this is our 10th year doing it. If you would like to enjoy finding herps in the wild and sleep in a bed at night with air-conditioning, hot water and only unpack your suitcase once, instead of daily, then this is the place to do it. Go to our web-site <http://hiss-n-things.com> and read the highlights of our trips. Read the statistics of each trip and visit the link showing photos of the 40 different species we have found along the way. E-mail at jim.kavney@gmail.com or call Jim Kavney, 305-664-2881.

Herpetological Research/Educator Internships: Research 4 Reptiles, LLC. is seeking two volunteer interns, ages 18 years and older, for the Summer 2013 season to assist in all aspects of herpetological research and educational classes. Our mission is to provide challenging, hands-on, field-based programs for participants ages 12 years and older to inspire enthusiasm for and understanding of native Illinois reptile and amphibian species. All educational programs are taught entirely outdoors at Midewin National Tallgrass Prairie in Wilmington, Illinois, and are limited to 8 participants. Internship details can be found on our website at: <http://www.research4reptiles.biz>. Email Holly Zak at research4reptiles@comcast.net or call 630-337-0757 for questions.

Line ads in this publication are run free for CHS members—\$2 per line for nonmembers. Any ad may be refused at the discretion of the Editor. Submit ads to mdloogatch@chicagoherp.org.



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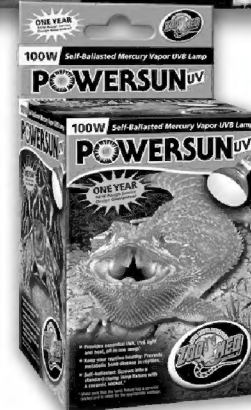
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ReptileFest 2013, April 13, 14

UPCOMING MEETINGS

The next meeting of the Chicago Herpetological Society will be held at 7:30 P.M., Wednesday, December 26, at the Peggy Notebaert Nature Museum, Cannon Drive and Fullerton Parkway, in Chicago. **This meeting will be a holiday party.** The CHS will provide soft drinks and snacks. If you would like to bring something edible to share with the group, you are invited to do so. If you would like to bring an animal to show off to the group, you are encouraged to do that as well. This will be a chance to socialize all evening and get to know your fellow members a little better.

Ray Pawley will speak at the January 30, 2013, meeting. Ray is a retired curator of reptiles at Brookfield Zoo, who now makes his home near Hondo, New Mexico. Ray's talk will cover "Brookfield Zoo Reptile House Techniques and Strategies That You Might Not Have Known About." This will be a report on techniques, methods and management protocols that Ray developed over the years at the Lincoln Park and Brookfield Zoos for captive herps.

The regular monthly meetings of the Chicago Herpetological Society take place at Chicago's newest museum—the **Peggy Notebaert Nature Museum**. This beautiful building is at Fullerton Parkway and Cannon Drive, directly across Fullerton from the Lincoln Park Zoo. Meetings are held the last Wednesday of each month, from 7:30 P.M. through 9:30 P.M. Parking is free on Cannon Drive. A plethora of CTA buses stop nearby.

Board of Directors Meeting

Are you interested in how the decisions are made that determine how the Chicago Herpetological Society runs? And would you like to have input into those decisions? If so, mark your calendar for the next board meeting, to be held at 7:30 P.M., January 18, 2013, in the adult meeting room on the second floor of the Schaumburg Township District Library, 130 S. Roselle Road, Schaumburg.

The Chicago Turtle Club

The monthly meetings of the Chicago Turtle Club are informal; questions, children and animals are welcome. Meetings normally take place at the North Park Village Nature Center, 5801 N. Pulaski, in Chicago. Parking is free. For more info visit the group's Facebook page.

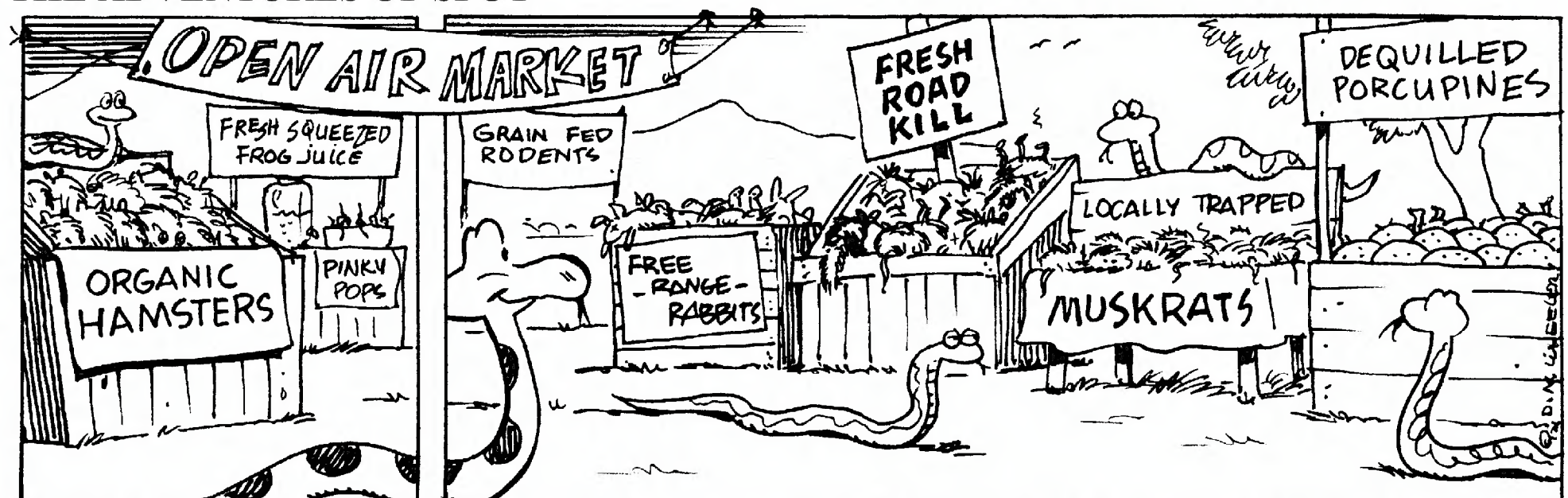
ELECTION RESULTS

As a result of the elections held November 28, 2012, the following officers and members-at-large will serve on the CHS Board of Directors for the year 2013.

President: Jason Hood
Vice-president: Cindy Rampacek
Treasurer: Andy Malawy
Recording Secretary: Jenny Vollman
Corresponding Secretary: Stephanie Capiello
Publications Secretary: Aaron LaForge

Membership Secretary: Mike Dloogatch
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